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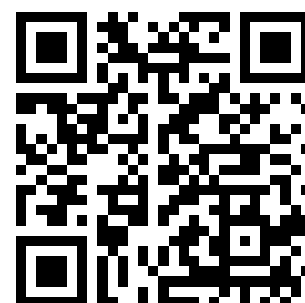


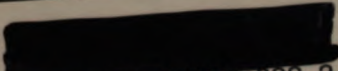
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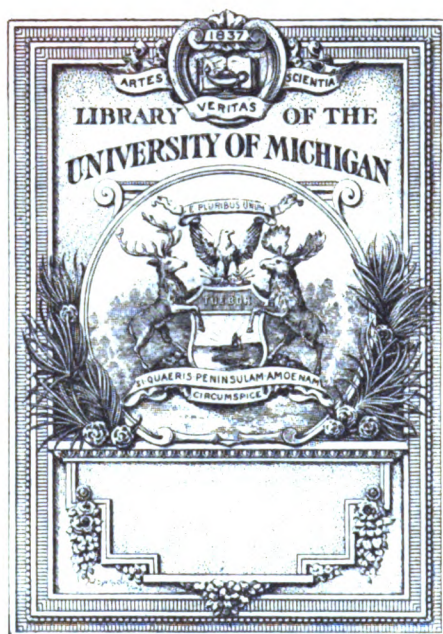
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# ELECTRICAL ENGINEERING

With which is incorporated

THE ELECTRICAL ENGINEER

(Established 1884)

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VOL. X.

JANUARY TO DECEMBER, 1914

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PUBLISHED BY THE KILOWATT PUBLISHING CO., LTD., 203-206, TEMPLE CHAMBERS,  
TEMPLE AVENUE, LONDON, E.C.





# INDEX TO "ELECTRICAL ENGINEERING"

VOL. X. 1914.

	PAGE		PAGE
GENERAL INDEX .....	iii	QUESTIONS AND ANSWERS BY PRACTICAL MEN (Including Answers to Correspondents) .....	vii
ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES .....	v	PATENT RECORD .....	viii
REVIEWS .....	vi	LOCAL NOTES (including "Tenders Invited and Prospective Business," and "Tenders Received and Accepted") .....	ix
ELECTRIC TRACTION .....	vi	COMPANIES' DIVIDENDS, REPORTS, MEETINGS, ETC. ....	x
TELEPHONY AND TELEGRAPHY (Including Wireless) .....	vii	NEW COMPANIES .....	xi

## GENERAL INDEX

- Accidents (including Supply Interruptions, Explosions, &c.)—See also under Factories and Workshops, and Mining Index.—(Mains Explosions, Departmental Committee's Report), 395; (Birmingham), 28; (Dundee), 28; (Eastbourne), 14, 28, 84; (Fire at Spiers and Ponds), 417; (Flywheel), 16; (L.C.C. Trams), 17, 589, 639, 651; (Ontario), 100; (Poplar), 599; (Shocks), 184, 438, 451, 589
- Advertising Dispute, 262
- Advertising Novelties, 94, 262
- Agriculture: [DRYSDALE], 6; [PRIESTLEY and KNIGHT], 102
- Air Filtration [GURRY], 7
- Air-gaps of Elec. Motors, 458
- Alternator Regulators, 643
- Aluminium, 412, 606
- Aluminium Feeder, 237
- Aluminium Lightning Arrester, 394
- American Elec. Eng. Handbook, 412
- Arc Lamp Lowering Gear, 285
- Arc Lamps: Globes [BAYNES], 507; (Carrier for), 653; (Long Burning), 44
- Armorduct Co., 555, 610
- Assoc. of Consulting Engineers, 93, 384, 617
- Assoc. of Engineers-in-Charge, 177
- Assoc. of Supervising Electricians, 176, 267, 546, 606, 608, 617, 649
- Australian Trade, 507, 652
- Aviation, Electricity and, 329
- Bakery (B.T.-H.), 196
- Balcke Exhaust Steam Accumulator, 368
- Barges, Electric, 302
- Battery Lamps: (B.T.-H.), 107; (G.E.C.), 53; (Siemens), 53
- Batti-Wallahs, 127, 269, 384
- Battleship, Elec. Equipment of [HORNOR], 585
- B.E.A.M.A.: 46, 457, 520, 613; (And the War), 465, 514, 531; (Chairman), 391; (Dinner), 61, 560; (Exhibition), 304; (General Conditions), 165, 250, 304, 405; (H.O. Regs.), 217; (Report), 61
- Belfast, 527
- Belgian Engineers, 583
- Belgian Relief Fund, 467
- Belgian Trade, 531, 646
- Bell. Elec. Operated, 312
- Belliss & Morcom (Birmingham Wks.), 325
- Birmingham: (Manufactures), 489; (Summer Lane Station), 320
- Bolton Power Station, 502
- Boosters, 239
- Bradford: (Turbine Contract, 54, 58, 490, 568
- Brewery Installation, 240
- Brimsdown Lamp Wks. Law Suit, 462
- British Association, 462, 471, 473
- British Elec. Industry, 'Position of [Scholey] 660
- British Engineers' Assoc., 489
- British Export Trade, 517
- Buzzer, 297
- Cable Casing: [JENNINGS], 70
- Cables: [BEAVER], 597; (Heating of), 407; (Henley's), 140, 219; (Pirelli-G.E.C.), 72; (Siemens), 273
- Callender's Hospital Fund, 70
- Camp Lighting, 649
- Canadian Exports, 417
- Carbons: (Carbon Supplies and the War), 470; (E.E. & E. Co.), 531; (B.O.T. Return), 560; (G.E.C.), 346, 471; (Herrion Carbons, Ltd.), 484; (Searchlight), 439
- Carbons, Alleged Theft of, 473, 489, 497, 508
- Cascade Motors [HUNT], 157
- Ceiling Roses, Standard, 484
- Celluloid and Incandescent Lamps, 214
- Celluloid, Storing of, 280
- Cement Works, Elec. in, 415
- "Central," The, 44, 429, 598
- Central Suspension Lighting: (London Elec. Firm), 54; (Wardle), 71
- Chemists' Factory, Electricity in, 430
- Chicago Generating Stations, 157
- Child Culture, Electricity and, 328
- Church Lighting, 286
- Cider Mills, Electricity in, 499
- Cinematograph Exhibition, 455
- Cinema Theatres: (The Half-Watt Lamp [Barber]), 480; (Carbons), 287, 470; (Equipment of), 495; (Kamm), 208; (Lighting), 213, 480, 530
- Circuit Breakers, 384, 444, 447, 476
- Clocks, Electric, 296, 312, 370
- Commutator Grinding, 376
- Competitions, 7, 94, 230, 563, 577, 587, 599, 610, 622
- Condenser Protective Gear, 261
- Condenser Tube Corrosion, 526
- Conduits and Fittings: (Grip Fitting Patent Case), 560, 598; (Hemming), 351; (Siemens), 273; (Simplex), 52, 122, 169; (Sun Elec. Co.), 352
- Consulting Engineers: (Etiquette), 292; (Congress), 203; (Liability), 224, 267
- Continental Trading Methods, 560
- Contract Conditions, B.E.A.M.A., 250, 304, 405
- Cooking (see also Heating): (Belling), 170; (B.T.-H.), 376; (Drake & Gorham), 244; G.E.C.), 273; (Simplex), 220; (Townshend), 182, 554
- Copper, Standard Resistance for, 237
- Cottage Lighting [FENNEL], 177
- Cotton Mills [STOKES], 146
- Cumberland Power Co., 61
- Daimler Motor Works, 326
- Daylight Lamps: (B.T.-H.), 136
- Diesel Engines Users' Association, 241, 653
- Diesel Engines (Macclesfield), 248, 293
- Disinfecting Fluid, 419
- Drury Lane Pantomime, 17
- Dust Clouds, Electrification by, 368
- Dynamo & Motor Industry, Effect of War on, 493
- Edison's Works, Fire at, 644
- Ediswan: (Works), 208, 261, 475, 515; (Heaters), 530; (Showrooms), 449
- Education, 21, 48
- Electrical Engineers' Ball, 14
- Electrical Proving House, 416
- Electrical Trade Benevolent Inst., 30, 102, 115, 158, 250, 457; (Dinner), 188
- Elec. Trades Union, 224
- Elec. Contractors' Assoc., 259
- Empire Trade, Organisation of [HIRST], 266
- Enamel Sprayers, 274
- Engineering Standards Committee, 406, 484
- "Equiluxo" Ash Tray, 612
- Exhaust Steam Accumulator, 368
- Exhibitions: Bradford, 348, 500; Cinematograph, 455; Holland, 308; Internat. Rubber, 103; Lowestoft, 124; Shipping, Engng. and Machinery, 104, 204, 473; South Met. Co., 149
- Factories and Workshops: (Chief Inspector's Report), 407; (Home Office Prosecutions), 237, 500; (Regulations), 100, 217
- Fans and Blowers: (G.E.C.), 403; (Simplex), 95, 389
- Faraday House, 232, 349, 553
- Feeder Pressure Regulators (B.T.-H.), 205
- Ferranti-Waters Protective Gear, 369
- Ferranti Watt-hour Meter, 293
- Field Regulators (G.E.C.), 604
- Finsbury Technical College O.S.A., 156
- Fire at Spiers & Pond's, 417
- Fire-escapes in Berlin, 430
- Fire Extinguisher, "Pyrene," 287
- Fittings: (B.T.-H.), 261, 272, 298, 489; (Ediswan), 138; (G.E.C.), 25, 625; (Simplex), 538, 581; (Townshend), 521
- Flex, "Thermoid," 547
- Flex [MELSON & BOOTH], 632
- Floor Machine, Rotary, 297
- French Red Cross Society, 568
- Frequency Transformers, 226, 268
- Fullarton Vibrometer, 663
- Fuses: (Electric Control), 565; (Fluvent), 634; (Kartret), 229; (Lundberg), 230
- Galvanometer, A New, 237
- Gas v. Electricity, 36
- General Electric Co.: (Brewery Installation), 240; (Carbon Works), 387; (Dinner), 158; (Fittings Works), 325; (Glassworks), 498; (Osram Lamp Works), 507, 512; (Press Visit), 346; (Witton Works), 322

GENERAL INDEX (*continued*).

- Generation and Transmission, Problems of [HUNTER], 596  
 Generators, Equalising Connections on, 462  
 German Elec. Industry, 632  
 German Industrial Difficulties, 609  
 Germany's Export Trade, 454, 465, 470, 499, 517, 519, 542, 554, 555, 561, 589, 659, 662 (see also "War")  
 Glasgow Power Station, 380  
 Glassware, British, 499  
 Golf by Electric Light, 201  
 Gottschalk, J., 567  
 Granite Quarry, Elec. in, 268  
 Greenock Elec. Soc., 525  
 Griller (Venner), 244  
 Grinders : (Butler), 26; (Morris & Lister), 633  
 Hackney, Three-phase Supply, 616  
 Half-watt Lamps, 8, 31, 72, 417; (A.E.G.), 108, 122, 267, 293; (Bristol Exhibition), 261; (B.T.-H.), 38, 412, 505; (Cartoon), 416; (Cinematograph), 480; (Drake & Gorham), 38; (Ediswan), 39; (Electrical Co.), 39; (G.E.C.), 37, 459, 665; (Light-houses), 459; (London Elec. Warehouse), 72; (Low Voltage), 333; (Manchester), 563; (Motor Car), 580; (New Sizes), 422, 436; [OLIVER], 60; (Prospects of), 31, 47, 60; (Siemens), 39, 400, 411; ("Why was England Late?"), 34; ("Z"), 38  
 Half-watt Lamp Fittings : (B.T.-H.), 38, 82, 95, 107, 136, 151, 565, 580; (Benjamin), 220; (Electrical Co.), 39; (G.E.C.), 96, 181; (Siemens), 39, 70, 119, 138, 400; (Wardle), 52, 168  
 Heating (see also "Cooking" and "Irons") : (Alheat), 245; (Bastian), 521; (Belling), 96; (Ediswan), 530, 624; (G.E.C.), 272, 580, 613; (London Elec. Trading Co.), 604; (Marylebone), 245; (Schonfeld), 662; (Simplex), 245, 554; (Submarines), 572  
 Helm Indicator, Luminous, 642  
 Hoardings : (B.T.-H.), 53; (Siemens Bros.), 352  
 Holophane Glassware, 652  
 Hot Weather (Cartoon), 380  
 Hotel Lighting, 262, 274  
 Hull Docks Elec. Equipment, 356  
 Ignition Battery (Braulik), 26  
 Incorporated Municipal Elec. Assoc. (see also Elec. Vehicle Committee under "Traction") : Annual Meeting, 366; Birmingham Conditions of Contract, 165, 250, 304, 405; Convention, 188, 282, 317, 319, 337, 357; Cartoon, 336; Dinner, 346; Preferential Charging, 578 (see also "Preferential Charging"); Replacing German Goods, 581; Wiring Bill, 78, 127  
 Inductive Interference of Parallel Circuits, 598  
 "Installation News," 643  
 Inst. of Civil Engineers, 236, 396, 568, 588  
 Inst. of Elec. Engineers : Annual Meeting, 292; Annual Report, 281; Birmingham Section, 236; Conditions of Contract, 165, 250, 304, 405; Conversazione, 380; Council, 187, 212, 281, 380; Dinner, 88, 224, 236; Faraday Inst., 570; Industrial Committee, 292, 371; Iron Filings Photo, 570; Lecture Theatre Lighting, 598; Leeds Section, 116; Lending Library, 100; Manchester Section, 226; National Service, 445, 472; New Members and Transfers, 30, 61, 128, 165, 202, 304; Presidential Address, 570; 1914-15 Session, 559; Royal Naval Division, 508, 528, 534; Sectional Addresses : (Newcastle), 596; (Scottish), 596; (Manchester), 598; (Birmingham), 617; Scottish Section, 281, 543; Suffragettes, 317; Tothill Estate, 292, 317; Western Section, 537; Yorkshire Section, 308, 589  
 Inst. of Mech. Engineers, 224  
 Insulation, Perfection of, 208  
 International Electrotechnical Commission, 115, 237  
 International Eng'g Congress, 6, 45, 116, 128, 226, 305, 329, 553, 628, 666  
 Interruptions to Supply—See Accidents.  
 Iron and Steel Inst., 214, 236, 280, 293, 484  
 Iron, Magnetic Testing of [NICHOLSON], 656  
 Ironmonger, The Electrical [MILNS], 591, 603  
 Irons, Elec. (Magnet), 298  
 Japan, Elec. Industry in, 440  
 Joinery Works, Elec. in, 168  
 Junction Box Explosion Responsibility, 599  
 Junior Inst. of Engineers, 100  
 Kapp Vibrator (Sandycroft), 214  
 "La Lumière Electrique," 656  
 Lamps, Incandescent (see also "Half-watt" Lamps, Lighting and Metal Filament Lamps) : (Admiralty and Employees), 635; (Canadian Trade), 560; (Carbon Filament Lamp Notes), 152; (Cartons), 53; (Corona), 521; (Ediswan), 515, 538, 643; (Exports), 371; (Flicker of) [LANGMUIR], 175; [HOWELL], 236; (L.C.C. and Foreign), 173; (Mazda), 509; (Osram), 507, 512, 530; (Wotan), 466  
 Lamp Bulb Factory, Lemington, 498; 635  
 Lamp, Hand, "Simplex," 509  
 Lampholder and Reflector, 634  
 Lampholder, Watertight, 633  
 Lampholders, Heating of [PATERSON], 632  
 Lantern Slides : (Berry, Skinner), 153; (G.E.C.), 140  
 Lanterns, Weather-Proof, 652  
 Lawsuits, Pending Elec., 545  
 L.C.C. : (Cable Employees' Wages), 545; (Foreign Lamps), 173  
 Lead-covered Wires in Plaster, 224, 267  
 Lemington Glassworks, 498, 635  
 Lighthouses, Half-watt Lamps in, 459  
 Lighting (see also Lamps, Incandescent and Street Lighting) : (Arcade), 298; (Bandstand), 389; (B.T.-H.), 11, 120, 179, 198, 230; (Business Premises), 623; [CLINTON], 203; (Criterion Restaurant), 230; (G.E.C.), 108, 218, 219, 351; Reduced London Lighting, 502, 536, 582, 629, 637, 663; (Salvation Army Congress Hall), 388; (Sea Front), 332; (Shop), 400, 566, 612, 624, 635; (Weaving Shed), 218  
 Lightning Arresters, 394, 493  
 Lightning Protection [LARMOR], 429  
 Liquidations, 109, 139, 183, 209, 222, 404, 451, 460, 467, 548, 594  
 Liverpool Turbo-Alternator Tests, 647  
 Ljungstrom Turbine Tests, 561, 628  
 Loans : (I.M.E.A. and B.E.A.M.A.), 78; L.C.C., 61, 537, 654  
 London Elec. Eng'rs (Territorials), 533, 609  
 London Elec. Supply, 278, 294, 329, 406, 428, 455, 511, 545, 577, 587, 609, 639, 654, 656  
 Lundbergs' Switching Competition, 94, 230, 563, 577, 587, 599, 610, 622  
 Macclesfield, 248, 293  
 Magnetite Arc Lamps, 220  
 Magnetos : (Supply of), 462; (B.T.-H.), 509  
 Magnets, Lifting, 384  
 Mains Explosions, Committee on, 395  
 Mains Protection, Split Conductor System, 551  
 Manchester Eng'g Societies, 293, 638  
 Manchester & Salford & District Building Trades Employers' Association, 224  
 Manchester Sub-Station, 466  
 Manufacturers, Appeal to, 463  
 Marconi, Mr., 437  
 Marine Lighting Sets, 613  
 Marylebone Alternator Tests, 646  
 Mather & Platt, 666  
 Mazda House News, 95, 140, 274, 459  
 Mercury Vapour Rectifier, 19  
 Metal Filament Lamps (see also Lamps, Incandescent, and Patents) : (B.T.-H.), 94, 230, 231, 430, 450, 476, 604; (Compulsory Licence), 404; (Ediswan), 82, 475; (G.E.C.), 81, 208, 653; [HARRISON & EDWARDS], 96; [HOWELL], 236; (Patents), 20, 122, 139, 144, 186, 208, 649; (Siemens), 94, 122; (Standardisation), 366; (United States), 70  
 Meters (Bastian), 376; (Elec. Apparatus Co.), 666  
 Meters, Ampere-hour, 435  
 Metrohm, The, 371  
 Military Defence, High Voltages in, 473  
 Milk Purification, 429  
 Motor-car Works, Elec. Driving of, 542  
 Motor-cars : (Accessories) [PROCTOR], 102; (Hooter), 352; (Lamps), 388; (Lighting) [HURRON], 119, 272; (Switchboard), 26; (Trials), 376  
 Motor Controllers : (Canfield), 564; (Elec. Apparatus), 197; (G.E.C.), 12; (Igranic), 107  
 Motor Generators at Oldham, 394  
 Motor, Heavy Peaks on, 624  
 Motors, Tale of Two, 274  
 Nat. Physical Lab., 370  
 "Nela" Research Laboratory, 274  
 Neon Lamp, 138  
 New Year's Honours, 27  
 Northampton Institute, 237, 486  
 North Met. Power Co. : (Bulk Supply Agreement), 381; (Strike Prevention Clause), 18  
 Obituary : Anderson, 305, 334; Bentley, 331; Birley, 639; Danckwerts, 243; Gott, 148; Gray, 250; Héroult, 276; Hope-Jones, 531; Newington, 414; Pichelmayer, 89; Swan, 305; Westinghouse, 157; White, 336  
 Old Centralians, 75, 115  
 Optophone, The, 370  
 Osram Lamp Works, 507, 512, 530  
 Overhead Transmission Lines : [Danger from], 536; [TROTTER], 49, 145; [WELBOURN], 35, 46  
 Ozonair Bleaching Process, 328  
 Ozonair and Recruiting, 547  
 Panama Canal, 225  
 Paris : (Floods), 336; (Supply), 44  
 Partnerships, 14, 71, 84, 139  
 Patents (see also Metal Filament Lamps, and Patents' Index) : Compulsory Working, 48, 102, 165; Foreign Patent Fees, 531; Report, 217  
 Perry, Prof. J., Retirement, 381  
 Phase Balancer, 19  
 Phoenix Accumulators, 401  
 Photometric Nomenclature [TROTTER], 305  
 Physical Soc., 304, 596  
 Physiological Effects of High-frequency Currents [THORNE BAKER], 7  
 Picture Galleries, Lighting of, 112  
 "Point Fives," 258, 280, 328, 365, 588  
 Police Lanterns, 53  
 Power Plant Testing [SELVEY], 628  
 Preferential Charging, 222, 266, 400, 406, 578, 606, 631, 646, 654  
 Preheater at Poplar Elec. Wks., 418  
 Press Guards (Verity's), 221  
 Printing, Elec. in [Broadbent], 657  
 Prosecutions, 280, 378, 473, 489  
 Pumps : (Merryweather), 122, 603; (Salvage), 311  
 Rating of Elec. Machinery, American, 657  
 Reactance : [FAVE-HANSEN and PECK], 189; [HOLLIS], 75  
 Rectigraph (Westinghouse Cooper-Hewitt), 94  
 Remuneration of Elec. Engineers, 656  
 Residence Tariffs [SEARROOK], 46, 62  
 Revolution Counter, 633  
 Rifle Range, Ediswan, 521  
 Rotary Converters, Starting of [HILL], 527  
 Royal Institution, 189, 666  
 Royal Soc. of Arts, 224, 334  
 Royal Society Conversazione, 369  
 Rumford Medal, 403  
 Russian Trade Directory, 554  
 St. Pancras Alternator Tests, 561, 628  
 Sales Managers' Association, 636, 660  
 Salford, New Turbine, 629  
 Schaffer & Budenberg's Works, 538  
 Sealing-wax Heater, 435

- Searchlights : (Carbons), 439; (Lond. Elec. Firm), 181, 466  
 Service Box, Charge for, 617  
 Sheffield : (Neepsend Station), 89; (Tramway Supply), 504  
 Ships, Elec. Equipment of : [DUBTALL], 34; (*Jupiter*), 177, 598; [Lowson], 596  
 Shocks (*see* Accidents)  
 Shorthand Typists from Berlin, 591  
 Showcard, An Attractive, 635  
 Showrooms : (Municipal), 19; (South Met. Lgt. Co.), 149  
 Signs : (Simplex), 208, 272; (Siemens), 643; (Venner), 369  
 Smit Transformer, 434  
 Snell, Sir John, 356, 377, 396  
 Social Functions, &c. : Elec. Installations, 182, 392; Evershed & Vignoles, 72; (G.E.C.), 199, 392, 436; Linolite Co., 414; Osram and Robertson, 181; Siemens, 167, 202, 389; Synchronome, 425; Western Elec. Co., 396  
 Society of Engineers, 646  
 Society for Elec. Development, 177  
 Solar Energy [ACKERMANN], 174  
 Split Conductor System, 551  
 Stage Plugs : (G.E.C.), 52  
 Storage Batteries : (America), 20; (Cut-out), 401; (Hagen Works), 152; [Rankin], 588  
 Straits Settlement, Trade with, 588  
 Street Lighting : (B.T.-H. Co.), 412; (G.E.C.), 95, 197; (Epsom), 42; Large Cities, 213; London, 502, 536, 582, 629, 637, 663; Manchester, 563; Westminster, 203  
 Strikes and Disputes : Leeds, 2; London, 16, 45, 59, 74, 87, 105, 126, 142, 159, 174, 202, 212; Osram, 171, 177, 187; Prevention of, 18; Smethwick Power House, 250  
 Sun Elec. Co., 499  
 Sun Worshippers (Ediswan), 182  
 Supply, Elec. (*see also* Accidents and London) : Bills and Provisional Orders, 14, 18, 19; Gas Companies' Bills, 13; London, 42, 56, 84, 88, 100, 112, 127, 146, 156, 201, 213; Paris, 44; Sheffield, 89; Stations, 248, 293, 294, 316, 320, 336, 502, 561, 628, 629, 646, 647  
 Switchgear : (B.T.-H.), 624; (G.E.C.), 285, 634, 663  
 Switchgear Contract, Large, 352  
 Switchgear Construction Co., 625  
 Switchgear, Automatic Protective [Wedmore], 638  
 Switch-ceiling Rose (Gen. Accessories), 94  
 Switch-plug (B.T.-H.), 168  
 Switches : (Lundberg), 412; (Simplex), 332, 475  
 Switching Competitions (Lundberg), 94, 563, 577, 587, 599, 610, 622  
 Symbols : (I.E.C.), 115  
 Tar Separation, Elec., 572  
 Tariffs, Standardisation of, 361  
 Television, 328  
 Tennis Court Lighting, 101  
 Textile Mill Driving, 521  
 Thermal Circuit-breakers : (Morris & Lister), 152  
 Thermopile, 287  
 Third Harmonic, Eliminating, The, 457  
 Tools : (Simplex), 136; (Witton-Kramer), 151  
 Tower Ladder, 436  
 Trade Disputes Act, 91  
 Trading with the Enemy, 502, 528, 538, 547, 588, 610, 635  
 Transformers [Teago], 226; (Smit), 434  
 Transformer Oil, Drying of, 555  
 Tucker & Co.'s Wks., 326  
 Turbines, Steam, Effect of Vacuum on [Stoney], 646  
 Turbo-Alternators : (Geared), 279, 293; (Liverpool), 647; (Manchester), 316, 336; (Marylebone), 646; (St. Pancras), 561, 628; (Salford), 629; (40,000 h.p.), 429  
 United States Central Stations, 212  
 Varley Magnet Co., 499  
 Verband Deutscher Elektrotechniker, 307  
 Vibrometer, The Fullarton, 663  
 Volunteer Civil Force, 455  
 Wall Plugs (Reyrolle), 566  
 WAR, THE. SPECIAL ARTICLES : (B.E.A.M.A.), 457, 465, 514, 531; (British Elec. Sup. Industry), 584, 589, 599; (British Export Trade, Openings for), 463, 470, 485, 499, 517, 541, 659; (Carbon Supply, 470, 484, 560; (Dynamo and Motor Industry, Effect on), 493; (East Coast Bombardment), 646; (Elec. Employees, and), 455, 461, 469, 479, 526, 596; (German Elec. Industry), 519; (Germany's Export Trade), 454, 465, 470, 499, 554, 555, 581, 659, 662; (Lamp Industry, Effect on), 463, 560; (L.B. & S.C. Rly. Contracts), 534; (Manufacturers, An Appeal to), 463; (Patents, Suspension of), 474; (Street Lighting, Reduced) 470, 502, 536, 582, 629, 637, 663; (Telegraph Isolation, Germany's), 534, 553; (Zeebrugge, Elec. Power at), 629  
 OTHER ARTICLES AND NOTES (Allied Governments' Supplies), 639; (A.E.G.), 654; (B.T.-H. Co.), 496, 508, 569; (Belgians), 467, 531, 583, 646; (Commercial Engagements), 606; (Contraband), 439, 553, 582, 666; (E.T.B.I.), 457; (French Red Cross), 568; (French Patents), 471; (Geipel & Co.), 508; (Government Work and Contracts), 453, 457; (Hart Accumulator Co.), 508; (I.M.E.A.), 581; (Live-wire Defences), 535; (London Elec. Eng. Force), 533; (Lundberg & Sons), 466; (Manchester Eng.'s Battalion), 496, 565; (Osram Lamp Works, Ltd.), 507; (Prince of Wales' Fund), 468, 471, 531; (Professional Classes, Relief for), 572; (Record Elec. Co.), 508; (Royal Garrison Artillery), 577; (Royal Naval Division), 508, 511, 553; (Scholey & Co.), 520; (Siemens Bros. & Co.), 496, 508; (Telegraphic and Telephonic Traffic), 458; ("Things that Happen in War Time"), 606; (Trading with the Enemy), 502, 528, 538, 547, 555, 588, 610, 635; (Tramway Rails), 473; (Volunteer Civil Force), 455; (Westinghouse Co.), 496, 572, 636; (Wiremen's Strike), 457  
 Water-power Schemes : Spanish, 7  
 Water Softening Amalgamation, 13  
 Water Softeners "Permutit," 412  
 Welding [HEATON], 114  
 West Ham Bulletin, 406  
 Willans & Robinsons (Rugby Wks.), 324  
 Wiring : (Law Suits), 224, 267; (Municipal), 19, 127, 578, 617; (Strikes), 236, 264, 378, 395, 457; (Manchester wages), 224  
 Wolverhampton Engng. Soc., 115  
 Woollen Trade, Elec. Driving in [Crowley], 659  
 Worcester, 327  
 "X" Rays, Uses of, 488  
 Zeebrugge, Elec. Power at, 629

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

- Accidents : (Blaenavon), 252; (Clifton), 484; (Senghenydd), 79, 129, 251, 306; (Wharfedale), 442, 481; Shocks, 4, 80, 200  
 Assoc. of Mining Elec. Engineers, 4, 5, 80, 195, 224, 236, 252, 306, 458, 504, 525, (Pres. Address) 573  
 Automatic Controllers [HUMPHRY], 193  
 Blairhall Colliery, 442  
 Blast Furnaces, 306  
 Blasting (South Africa), 3  
 Cable, Repair to [SMITH], 252  
 C.M.B. Winding Machines, 444  
 Castleford Collieries, 307  
 Electricity in Mines : [Aust.], 79; (B.T.-H.), 133; Campaign against, 133; [Gregory], 576; [Holliday], 573; [KERR], 254; [NELSON], 133; Possible Cause of Explosions, 382; [Prest & Leggat], 382; Reports, 3; Safe Use of [THORNTON], 482; South Africa, 4; [WILLIAMS], 255  
 Exhaust Steam Colliery Plant, 481, 497  
 Fault Testing [BEADSMOORE], 255  
 Fire-damp Detector, 442  
 Furnace Charging Machine, 484  
 Furnace, Three-phase Arc, 306  
 Gas Detector, Elec., 576  
 Gas Engines for Collieries, 382  
 Gas Ignition by Sparks, 383  
 Haulage Road Cables, 573  
 Home Office : Mining Regulations, 251; Prosecutions, 5, 252, 586, 619  
 Illinois, Mining in, 4  
 Inspector of Mines, Reports, 441  
 Internat. Cong. of Min. Met. and Engineering, 307  
 Iron and Steel Industry, and War, 473  
 Iron and Steel Inst., 280  
 Iron, Electrolytic [GUILLET], 524  
 Kent Colliery [WROE], 131  
 Kolar Mines, 306  
 Lamps, Maintenance of (Maurice), 618  
 Ledston Colliery Equip., 442  
 Lifting Magnets, 307  
 Magnetic Properties of Alloys [HADFIELD & HOPKINSON], 280  
 Mining Inst. of Scotland, 80, 442  
 New South Wales, 573  
 North Staffs Inst., 576  
 Patents (*see also* Patents Index), 5, 80, 131, 195, 257, 308, 384, 443, 482, 526, 619  
 Power Factor Improvement [ROUTLEDGE], 575  
 Rand Mines. Elect. in, 442  
 Rolling Mills, 524; [DAVID], 194; [ROTHERA], 252  
 Safety Lamps, 4, 129, 383; [Bristol], 618; [Hailwood], 575; [Home Office], 253; [TURQUAND], 130, 149; [U.S. Bureau of Mines], 5  
 Senghenydd Disaster, 79, 129, 251, 306  
 Signal Wires and Gas Ignition, 78  
 Signalling System, 256, 443  
 South Wales Miners' Federation, 253  
 Steel : Elec. for the Allies, 573; Elec. M'fre of, 306, 383; from Cast Iron, 102  
 Switchgear : (Reyrolle), 133; (G.E. Co.), 254  
 Tangent Signalling System, 443  
 Telephones and H.O. Rules, 130  
 Transformers (Reyrolle), 4  
 "Waste" Power [HARRISON], 195  
 Wharfedale Disaster, 442, 481  
 Winding : [DAVID], 194; (France), 193; [GILLESPIE], 194; (U.S.A.), 130  
 Wireless Telephones, 257

## REVIEWS

Alternating Currents and Alternating-current Machinery [JACKSON and JACKSON], 64  
 American Electricians' Handbook [CROFT], 165  
 Annuaire de l'Electricité, 68  
 Answers to Problems in Essentials of Electricity for Wiremen and the Electrical Trades [TIMBLE], 164  
 Automatic Telephony [TURNER], 67

Boiler Explosions [STROMEYER], 76

"Central," The, 44, 429, 598  
 Concrete and Constructional Engineering, 103  
 Continuous- and Alternating-current Machinery [MORECROFT], 658

Dignity of Business [MORGAN], 184  
 Direct and Alternating Current [CLEWELL], 658  
 Drawing for Electrical Engineers [WORRALL], 659

Electric Lighting [AVERY], 67  
 Electric Lighting Accounts [JOHNSON], 65  
 Electric Traction [CALISCH], 659  
 Electric Wiremen's Work [HAVELOCK], 68  
 Electrical Engineering [CHRISTIE], 161  
 Electrical Engineering Problems [CALDWELL], 163  
 Electrical Engineers' Diary, 13  
 Electrical Practice in Collieries [BURNS], 525  
 Electricity in the Service of Man [WALMESLEY], 65  
 Electro-thermal Methods of Iron and Steel Production [KERSHAW], 160  
 Elektrischen Metallfadengluhlampen insbesondere aus Osmium, Tantal, Zirkon und Wolfram [WEBER], 160  
 Elements of Electricity [ROBINSON], 658  
 Elementary Graphic Statics [WIGHT], 68

Elementary Magnetism and Electricity [GANSKY], 659  
 Elementary Principles of Illumination and Artificial Lighting [BLOK], 161

Faraday House Journal, 102  
 Finsbury O.S.A. Magazine, 17  
 Formulae and Tables for the Calculation of Alternating-current Problems [COHEN], 66  
 Fuel: Solid, Liquid, and Gaseous [BRAME], 649

Handbook of Electrical Methods, 165  
 Handbook of Technical Instruction for Wireless Telegraphists [HAWKHEAD], 67  
 Handbook of Wireless Telegraphy [MURRAY], 68, 163  
 Hazell's Annual for 1914, 68

Illumination, Pocket Book [ECK], 658  
 Incandescent Electric Lamps and their Application [OGLEY], 165  
 India-rubber Laboratory Practice [COSPARI], 649  
 Insulation and Design of Electrical Windings [FLEMING and JOHNSON], 64  
 Inventor's Adviser and Manufacturer's Handbook to Patents, Designs, and Trade Marks [HADDAN], 68  
 Inventors' and Patentees' Year Book for 1914 [TAYLOR], 164

Jahrbuch der Elektrotechnik for 1912, 67

Leitfaden der drahtlosen Telegraphie für die Luftfahrt [DIECKMANN], 164

Naval Warfare [THURSFIELD], 68  
 Northampton Engng. College Magazine, 7  
 Northampton Gazette, 36

Photo-electricity [HUGHES], 649  
 Practical Electricians' Pocket Book for 1914, 68

Practical Engineer Electrical Pocket-Book and Diary for 1914, 68  
 Practical Uses of the Wave Meter in Wireless Telegraphy [MAUBORGNE], 161  
 Principles and Practice of Electrical Engineering [GRAY], 659  
 Private Companies [JORDAN], 666  
 Problems in Alternating-current Machinery [LYON], 163  
 Proceedings of the National Electric Light Assoc. of America, 68

Queen's Engineering Works Magazine, 75

Rugby Engineering Soc. Proceedings, 68

Sell's Directory, 102  
 Soft Soldering, Hard Soldering, and Brazing [HOBART], 68  
 Spon's Architects' and Builders' Pocket Price Book, 1914, 68

T.S.F. [PETIT and BONTILLON], 161  
 Telegraphy [PREECE and SIVEWRIGHT], 658  
 Telephone Cables [SLIPPY], 65  
 Text-book of Physics [POYNTING and THOMSON], 161  
 Transformer Practice [TAYLOR], 66  
 Transmission Line Formulas for Electrical Engineers and Engineering Students [DWIGHT], 64

Universal Electrical Directory (J. A. Berly's), 164

Village Electrical Installations [WARDALE], 66

Wireless Telegraphy: A Handbook for the Use of Operators and Students [MARCHANT], 163  
 Wireless Telegraphy and Telephony Year-book, 649

X-Rays [KAYE], 658

## ELECTRIC TRACTION

Aberdeen, 375, 387, 496  
 Accidents: Railway, 517; Tramcar, 217

Bachelet's Levitated Railway, 331  
 Bagdad, 228  
 Bath, 148  
 Battery Charging Tariffs, 259  
 Bombay, 78  
 Bournemouth, 271  
 Bradford, 409  
 Brighton, 348  
 Bristol, 259, 271, 331, 348, 409, 528, 590  
 Bristol Elec. Trac. Co., 296, 373, 399, 553  
 Burntisland Collision, 387

Charging Plug for Elec. Vehicles, 516, 562, 607, 645  
 Chicago, Milwaukee & St. Paul Rly., 651  
 Colne, 93  
 Commercial Vehicles [CLARKSON], 190; Charging of, 412  
 Conductor Rails: Steel, 496; Testing, 34

Direct-Current Rly., 1,200 volt, 6  
 Distribution, Elec. Rly., Economics of [PARSHALL], 601  
 Dundee, 387

East London Rly., 78  
 Elec. Vehicle Assoc. of America, 606  
 Elec. Vehicle Committee (I.M.E.A.), 146, 202, 302, 445; (Charging Plug), 516, 562, 607, 645  
 "Elec. Vehicle," The, 639  
 Electric Vehicles, 72; (and War), 468, 632; (Curtis), 267; (Edison), 418, 419; (Ipswich), 84, 175; (Lloyd), 143; (Swansea), 42; (S. Shields), 496

Elephant & Castle--Watford Service, 473  
 Escalators, 553

Glasgow, 409  
 G.E. Rly., 109  
 G.N. & City Rly., 228

Hastings, 24, 50, 109, 271, 433  
 Holland, 1,200-volt D.C. Rly., 6

Italian State Railways, 308, 601

Japan, 563

L. & N.W. Rly., 24, 93, 148, 228, 303  
 L. & S.W. Rly., 135, 399, 433, 533  
 L. & Y. Rly., 24  
 L.B. & S.C. Rly., 9, 135, 421, 534  
 L.C.C., 17, 24, 50, 78, 207, 271, 308, 387, 433, 496, 589, 590, 601; (Tramway Breakdown) 639, 651  
 Lincoln, 331, 339  
 Lisbon, 282  
 Liverpool, 24, 34, 78, 148, 177  
 Locomotives: [A.E.G. JOURNAL], 228; [LYDALL], 117, 135  
 London Elec. Rlys., 117, 135, 159, 191, 230, 302, 433, 553  
 London Traffic, 50; (Conference), 78  
 London Tramway Co.'s, 177

Magnetic Brake Design, 563  
 Manchester, 159, 308  
 Mercury Vapour Rectifiers, 93  
 Met. Assoc. Tram. Managers, 553  
 Metropolitan & Gt. Northern Railway Cos., 375

Midland Rly., 78, 148  
 Montreal, 135  
 Motor-omnibuses v. Trams, 409  
 Motor-van Parade, 305  
 Multiple-unit Control, 148  
 Municipal Tramways Assoc., 473

New Michigan--Chicago Rly., 621  
 New York, Westchester & Boston Rly., 159  
 North Staffs. Rly., 117  
 Northern Gen. Transport Co., 9, 433  
 North Eastern Rly., 271

Oldham, Ashton & Hyde Tramways, 409, 473  
 Oxford, 24, 282

Pennsylvania Rly., 24  
 Post Office Elect. Rly., 421, 433, 563, 632

Railophones, 24, 148  
 Rails: [SELLON], 117; [WILLOX], 117  
 Railway Electrification [ROGER SMITH], 103 [FIRTH] 243  
 Railway Lighting, 238  
 Railway Motive Power [Dalby] 473  
 Railway News, 50  
 Ramsbottom, 282  
 Rhactian Rly., 93  
 Rochdale, 259  
 Rolling Stock [O'BRIEN], 158

Shanghai E. C. Co., 282  
 Sheffield, 496  
 Signalling, 46 [BROWN], 205; (Damage to) 508; (on C.L. Rly.) 447; (on Locomotives) 651

Stockholm Railway, 296  
Stoke-on-Trent, 271, 591  
Strikes and Disputes: (Wolverhampton) 24  
Ticket Machine, Automatic, 243  
Traction [Dawson], 158  
Trailers: (L.C.C.), 24; (London United), 207  
Train Lighting, 50, 238, 449; [Ferguson], 115

Tramways Bills, 9  
Tramways & Light Rlys. Assoc., 375, 421  
Trolley Omnibuses: (Brighton and Hove), 24, 117, 148, 159, 191, 528, 562, 651; [GRIFFITHS], 191; (N.E. Rly.), 207; (Nelson), 50; (Bills), 9  
Trolley-wire Splicing, 287  
Tube Rlys. (see also London Elec. Rlys.): (Intercommunication), 473; (Lighting), 230; (N. & S. Shields), 9, 148; (P.O.), 78, 421, 433, 563, 632

Underground Elect. Rly. Co., 375  
Usui-Toge Rly., 159

West Ham, 409, 421  
Wolverhampton, 331

York, 331

## TELEPHONY AND TELEGRAPHY (Including Wireless)

Advisory Committees (Telegraphy), 78, 421; (Telephony), 179  
Anglo-Irish Cables, 9  
Automatic Clears [AITKEN], 91  
Automatic Records for Wireless, 218  
Automatic Telephones: (Betulander), 399; Exchanges, 50, 409, 543, 550, 553; P.O. Work, 545; (Siemens), 113; (Zurich), 632

Cable v. Wireless Telegraphy [BRIGHT], 63

Canada, 217  
Capacity of Radio-telegraphic Aerials [Howe], 473  
Channel Cable, New, 537  
Check Call Meters, 308  
Chelmsford and Letterfrack, 282  
Christiania, 387  
Colin-Jeanne System, 398  
Condensers [DUDDELL], 78  
Constantinople Telephone Co.'s Staff, 579  
Continental Cables, 488

Darlington Automatic Exchange, 550  
Detectors for Wireless [COURSEY], 105  
Direct United States Cable Co., 241

Eclipse Observations, 433, 458, 473  
Examination Answers, Humorous, 563

Fog Signals, Wireless Control of, 528

Germany's Isolation, 534, 553  
Goldschmidt, 241, 296  
Great Northern Telegraph Co., 271  
Grindell-Matthews Wireless Syndicate, 159, 232  
Guernsey, 9

Heaviside, 399  
Hull, 24, 117, 135, 207, 296, 537

Imperial Wireless Scheme, 135, 148, 191  
Inter-Imperial Cable Link [BRIGHT], 409

Loaded Aerial Lines [HILL], 78  
Long Distance, in Australia, 506

Magneto Boards: (Peel-Conner), 63  
Marconi Co.: 217, 228, 241, 348, 381, 387, 398, 409, 421; (American Patents), 191; (Chinese Government), 421; (Dividends), 488; (v. Helsby Co.), 117, 228, 296, 381, 398, 409, 433; (Mercantile Shipping), 433  
Marconi Bellini-Tosi Apparatus, 375, 473  
Marconigraph, 91  
Merchant Shipping Bill, 308  
"Museum" Telephone Exchange, 543

Nat. Telephone Co., 159, 296, 375  
North-East Coast Instn. of Engrs. & Ship-builders, 241  
Nottingham Wireless Soc., 117

Pacific Cable Board, 621  
Peel-Conner Telephone Co., 348  
P.M.G. Report, 642  
Portsmouth Telephones, 34, 331  
Post Office Estimates, 259  
Printing Apparatus, 651  
Pupin Loading System, 399

Relays: [JUNO], 159

Quenched Spark Wireless (Siemens), 63

Safety of Life at Sea, Internat. Conference, 50

Strowger Patents, 159  
Swansea, 282

Telefunken Zeitung, 117, 241  
Telegraph and Telephone Journal, 553  
Telegraph Service Committee, 421  
Telegraphy, 10, 78; (Effect of War on), 458, 465, 473, 488  
Telephone Directory Key, 538  
Telephonic Communication: [FLEMING], 191; London-Switzerland, 9; (Wireless), 259  
Thermophone, The, 651  
Time Signals, P.O. Attitude, 91

West Riding Corporations, 408  
Western Elec. Co.'s Catalogue, 286  
Wireless Stations, New, 135, 148, 217, 218; Cape Race, 473; Hudson Bay, 473; Carnarvon, 282, 296, 398; German Pacific, 632; Illicit, 537, 545, 553, 591, 601, 632; International Bureau Return, 661; Italian, 537, 642; Nauen and Pola, 282; New Jersey, 612; Sayville, 563; Schuster, 553; San Francisco-Honolulu, 563; Tuckerton, 24, 308, 375, 601; Woosung, 433

Wireless Telegraphy: 34, 159; [CAMPBELL-SWINTON], 63; [COURSEY], 105, [FLEMING], 91, 600; (French Inter-Colonial), 218; [HOWE], 651; (Marine), 24, 109, 179, 375; (Poulsen System), 241; (Polar Expedition), 408 (Research Committee), 54, 331, 408; (Reorganisation of Coast Stations), 148; (Siemens Quenched Spark), 63; (Strength of Signals), 149, 433; [TAYLOR], 621; (on Trains), 78  
Wireless Telephony, 159, 257, 259, 348, 409, 473

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

(Including Answers to Correspondents.)

A.C. Motor Switching, 90  
Accumulator Switches, 165  
Alternators in Parallel, 36  
Answers to Correspondents, 62, 91, 269, 617

Ball Bearings, 75  
Barbed-wire Entanglements, 526  
Boats, 215  
Brake, Crane, 227  
Brake "Kicking" Coil, 176  
Brush-holder Design, 472

Cable Testing without Cutting, 660  
C. & H. Ampere-hour Meters, 486

Compound-wound Generators, 494  
Compounding Alternators, 104

Earthed Cable Testing, 396  
Earths, Intermittent, 20  
Fault Localisation Search Coil, 617

Hartmann & Braun Voltmeter, 419

Induction Motors, 62, 190

Lighting, Scheme of Distribution, 46  
Lightning Conductors, 630

Limiting Safe Temps., 440  
Magnetic Arc Lamps, 116  
Meter Capacity, 576  
Motor, Shunt-wound, Speed of, 617  
Motor-generator, Three-phase, 431  
Motor Winding, 562, 576

Pipe-ventilated Motors, 147  
Planer Drive, 294  
Reducing A.C. Pressure, 128  
Regenerative Braking of Three-phase Motor, 374  
Rotary-converters, 518, 600, 608  
Single-phase Motor Starting, 349

Static Balancers, 640  
Steel, Heat Treatment, 504

Tramway System, 269  
Transformers: Earth Indicator, 227, 257; Three-phase Break-down, 239; Heating Time Constant, 283; Single-phase, 535; Winding Ratios, 544; Protection from, 648  
Turbo-generators, Reactance of, 8

Watt-hour Meters, 309  
Wheatstone Bridge, Resistance of, 385  
Wireless, 204  
Wiring, 329



## PATENT RECORD

**Arc Lamps:** Ayrton, 134, 178, 350, 446, 519; Brockie and Johnson & Phillips, 134; Bryer Golder & Pearce, 270; B.T.-H., 233, 432; Conradty, 487; Deutsche Gasglühlicht Akt. Ges., 295; Lewis, 456; Railing and Angold, 330; Tate and Monkhouse, 216; Weintraub, 260

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H., 69, 131; B.T.-H. and McCarthy-Jones, 195; B.T.-H. and Wedmore, 590, 661; Clothier and Reyrolle, 602; Crompton and Burge, 192; Cunliffe, 492; Despesaillies, 446; Graham and Ricketts, 41; Heany, 134; Heins, 51; Hemming, 474; Hollister, 456; Lucas, 446; Mirza, 216; Reyrolle, 602; St. Helens Cable Co., 650; Siemens, 41, 233; Siemens-Schuckert, 216; Siemens and Wilson, 41; Smith and Garnett, 192; Torchio and Woodron, 446; Waters, 410

**Dynamos, Motors, and Transformers:** A.E.G., 295, 310; Alexander, 178, 233; Arno, 410; Ateliers de Construction Elect. de Charleroi, 456; Bosch, 350; Brit. Elec. Trans. and Crosbie-Hill, 216; Brown Boveri, 242, 611; B.T.-H., 41, 192, 630; B.T.-H. (G.E. Co., U.S.A.), 270, 386, 536; B.T.-H. and Whitaker, 51, 661; Coates, Mirrey and Reyrolle, 579; Crompton and Burge, 23; Faye-Hansen, 590; Fuller, 456; Heenan & Froude, 590; Heyland, 23; Hunt and Sandycroft, 270; Klinkenberg, 330; Ljungström and Widström, 150; Menzforth (B.W. Co.), 529; Mond, 506; Newton, 206; Olmstead, 552; Phoenix Dynamo and Pohl, 10; Railing and Garrard, 92; Rolfe, 106; Rosenberg, 69; Rübel, 118; Siemens, 178, 233, 242, 284, 474; Siemens Schuckertwerke Ges., 295, 446; Storer, 519; Taylor, 590; Wade, 492; Weiss, 295

**Electrometallurgy and Electrochemistry:** Ansaldo & Co., 86; Benjamin, 80, 195; B.T.-H., 216; Cowper Coles, 397; Grützel, 69; Guggenheim, 257; Hybinette, 195; Johnson, 5; Jones, 195; Krupp, 5, 257; Machalske, 619; Mack, 195; Mies, 192; Strohmenger, 80; Thompson, 51; Tischenko and Plauson, 80; Wallace and Wassmer, 5; White, 166; Yount, Finigan and Brannaman, 195; (Furnaces), B.T.-H., 41, 330; Craig & Spence, 257; Ellis, 310; Eyer mann, 80; Fischer, 216; Helfenstein, 5; Helfenstein Elektro-Ofen., 5; Hiorth, 131

**Ignition:** Biblecombe and Thomas, 151; Mordey, 69; Spada, 260, 602; Unterberg & Helmle, 397

**Incandescent Lamps:** Bastian, 552, 564, 621; Beckwith, 242; Brackensieck, 564; B.T.-H., 41, 118, 506; B.T.-H. (G.E. Co., U.S.A.), 310, 487; Canello, 134; Dobson (Foster Engng. Co.), 546; Estéve, 641; Gladitz, 77, 89, 386; Guisti, 166; Just, 350; Kanazawa, 106; Kruger, 420; Lowden, 118; Mackay, 519; Read, 77; Roux and Sanchez, 106; Siemens, 178; Simpson, 446; Trenzen, 51; Walling, 206; West. se. metallfaden Glühlampen Fabrik Ges., 242; Wolfram Lampen, 23; Zschocke, 41, 69; (Vapour Lamps), Claude, 23; Voigtländer, 284; Wade, 242; Westinghouse Metallfaden Glühlampen Fabrik Ges., 260

**Instruments and Meters:** B.T.-H., 206, 284, 641; Hartmann & Braun, 150; Kolster, 420; Petersen & Kemp, 446; Siemens, 134, 242

**Storage Batteries:** Naylor, 579; Read & Bransan, 564; Scott, 166, 206; Siemens, 92; Soc. Gen. des Nitrures, 270; Stasano, 5; Wardale and Marchant, 80

**Heating and Cooking:** Bastian, 77, 564; Berry, 10, 579, 641; Campbell, 373, 446;

Clarke, 456; Cox, 650; Dalton, 192; Dowsing and Huntley, 10; Downe and Brompton Co., 621; Pate & Wood, 519; Perry and Credenda Conduits, 519; Rippingille, 242; Simplex Conduits, 611; Sprenger, 386; Weaving and Ferranti, 118, 397

**Switchgear, Fuses, and Fittings:** A.E.G., 192; B.T.-H., 350; Baerlocher and Allen West, 51; Berry, 630; Berry and Markham, 611; British Insulated and Blades, 80; Brown, Boveri & Cie., 487; Day, 242; Fincato, 529; Holt & Smith, 552; Jones, 579; Lucas, 242; Lundberg, 242; Martin, 69; Railing, 310; Short, 564; Simplex Conduits, 373; Western Elec. Co., 630; Widegren, 536

**Telephony and Telegraphy:** Arnold, 51; Betulander, 611, 621, 641; Brown, 650; Campbell Blacknoll and Colpitts, 10; Creed, 552; Eastern Telegraph Co. and Jenkins, 350; Ericsson and Dahlström, 474; Freeman, 661; Giles, 650; Graham, 330; Hulfish, 248; Kaehler, 134; Kennedy and Turner, 206, 552; Otto, 602; Pecorini, 92; Pleigel and Olsson, 410; Siemens & Halske Akt. Ges., 270; Squier, 641; Sterry, 106; United Telegraph & Cable Co., 487; Western Electric Co., 260, 373, 386, 464, 579; Williams, 150; (Wireless), A.E.G., 456; B.T.-H., 77; Balsillie, 432; Chambers, 166, 233; Ditcham and Grindell-Matthews, 206; Dwyer, 456; Fessenden, 492; Fleming, 529; Galletti, 474; Lee and Hogan, 192; Leimbach, 310; Marconi, 23, 118, 150, 233, 310, 330, 397, 579, 590, 650; Mellersh Jackson, 270; Miller, 661; Shephard and McKechnie, 51, 69; Signal Ges., 41, 77, 178; Thompson, 420; Torikata, Yokoyama and Kitamura, 106

**Traction:** A.E.G., 446; Cross, 69; Diamond, 546; Hall & Riley, 590; Helfenstein, 118; Lucas, 446; Marks, 242; Siemens, 78; Storer, 650; Wills and Sykes, 590, 621; (Signalling) Boot, 397; Dearle, 410; Heaton, 118; Marks, 260; Siemens, 206; Siemens and Scourfield, 134; Vignier, 51; Westinghouse, 77

**Miscellaneous:** A.E.G., 420; Adams, 10; Aikman, 546; Attwater, 131; B.T.-H., 216, 432, 446; Baker, 602; Beckett & Anderson, 5; Bergmann, 77; Bickford, Smith and Smith, 131; Blenheim, 579; Bowes, Scott & Western and Dalgleish, 131; Brooks & Holt, 611; Caldwell, 69; Cold Light, Ltd., and Hayles, 611; Couch, 641; Darmais and Leblanc, 536; Dean, 552; Faber, 257; Faerber, 80, 257; Faigle, 77; Fithian, 178; Fraser, 77; Gray & Best, 529; Gwynn and Clerk, 92; Hill, 77; Holophane, 536; Joseph, 630; Joyce and Spagnoletti, 619; Klaeden, 5; Kraus, 350; Krüger, 134; Krupp, 195, 257; Leonardt, 546; Lucas and Turner, 621; Macdonald, 257; McClelland, 546; McKinnie, 602; Masch. Humboldt, 5; May, 260; Moore-Licht, 92; Morris & Lister, 564; Nathorst, 5; Newitt & Fletcher, 621; Nicholas, 195; Palmer, 5; Paxton, 257; Philip and Steele, 195; Reineke, 257; Rosenberg, 5; Siemens, 41; Siemens & Halske, 464; Wade, 241; Wall, 270; Webster, 260; Williams, 166, 192; Wolf, 5, 80

Elec. Trans. Co., 536; Joel, 410; Lundell, 386; Phillips, 492

**Electrometallurgy and Electrochemistry:** Baker, 216; Haas, 284

**Ignition:** Hall, 590; Simms and Bosch, 216

**Instruments and Meters:** Duddell, 529; Wright and Reason Mfg., 69, 150, 166, 519

**Switchgear, Fuses, and Fittings:** B.T.-H., 242, 492, 546; De Kando, 446; Ediawan, 81; G.E.C., 489; Kartret, 167; Krupp, 51; Mayes, 330; Partridge, 487; Ward, 611

**Telephony and Telegraphy:** Brown, 233; Brown and Dearlove, 178; Campbell, 492; Chambers, 611; Fleming and Marconi Co., 552, 590; Mansbridge, 564; Marconi, 166, 233; Muirhead, 106; Muirhead and Edgar, 118; Pollak, 233; Pupin, 397

**Traction:** B.T.-H., 564; Brown, 564; Smith, 270; Sykes, Johnson & Cooke, 579; Westinghouse Brake, 106

**Miscellaneous:** Benedicks, 552; Blake & Marscher, 661; Duddell, 611; Fischer, 350; Gronwald, 464; Haddan, 242; Hill, 373; Johnson & Makin, 650; May and Pulsometer Eng'g, 216; Ottaway, 178; Scott, Varley and Anderson, 69; Soc. Elec. Metall. Française, 492; Strecker, 206

## Amendments and Oppositions

**Arc Lamps:** Ayrton, 519; B.T.-H., 150; Blondel, 233; Körting & Mathieson, 23

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H., 69, 373; Hemming, 529; Townson, 410

**Dynamos, Motors, and Transformers:** B.T.-H. and Given, 590; Crompton & Co., 295, 432; Price, 295; Spinelli, 166; Vandervell and Midgley, 23, 41, 51, 178; Zenk, 630

**Electrometallurgy and Electrochemistry:** B.T.-H., 150, 410; Du Bois, 150; Schmidt and Desgraz, 350

**Ignition:** Bartschi, 474; Hopps, 546; Longford and Clark, 192, 233, 242; Spada, 386, 661; Sparking Plug Patents, Ltd., 464; Unterberg & Helmle, 611

**Incandescent Lamps:** B.T.-H., 233, 420; Bastian, 602, 650; Brimsdown, 233; Fischer, 106; Just, 373; Leiser, 192; Pintsch, 23, 144; Popes' Elec. Lamp, 10, 92; Reeves, 233, 432; Schwarzkopf, 492; Schwarzkopf v. Gladitz and B.T.-H., 295, 373, 397; Siemens, 118; Treuzen, 166, 410; Westinghouse, 178, 206, 386; Wolfram-Lampen, 186

**Switchgear, Fuses and Fittings:** Doulton, 330; Mygatt, 386; Statter, 166, 192; Townson, 178, 310, 410

**Telephony and Telegraphy:** Adlington, 611; Aitken, 492; Automatic Telephone Co., 590; Bijur, 410; Conner & Kahl, 519; Corwin, 440; Drahtlose Telegr., 106; Eastern Telegraph Co., 420; Graham and Ricketts, 178; Jamieson, 10; Kennedy & Turner, 310; Rouzet, 23; Siemens Bros. & Co., 611; Sterling Telephone and Dungle, 590

**Traction:** Auger, 611; Internat. P.A.Y.E. Tramcar Co., 242; Peckham & Thomas, 611; Werndorf, 150

**Miscellaneous:** Adlington, 536; Aron, Wiener and XL Elec. Co., 192; Carey & Waygood, 590; Clarke and Chadburn's Teleg., 150; Close, 192; Corsi, 529; Davies, 92; Doulton & Morris, 630; Foyle and Britannia Folding Box, 134; Grugeon, 536; Handcock, 641; Justice, 602; Keppie and Maddick, 10, 150; Ludicke, 506; Lyon, 350; Musgrave, 118; Scott, 487; Siemens Bros &

## Expired Patents

**Arc Lamps:** Bremer, 77; Cooper Hewitt, 373

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H., 242; Howard, 92

**Dynamos, Motors, and Transformers:** B.T.-H., 432, 641; Berry and Brit.

Co., 546; Statter, 397; Swainson, 564; White, 621; Williams, 446, 621; Wright, 529

## Restorations, &c.

**Electrometallurgy and Electrochemistry:** Schwerin, 134

**Incandescent Lamps:** Wolfram Lamp A.G., 233

**Switchgear, Fuses and Fittings:** Bertram Thomas, 106, 284; Hunter, 397, 564; Vaughan & Birch, 92

**Telephony and Telegraphy:** Tidnam, 23, 410

**Traction:** Reid, 150

**Miscellaneous:** Hawley & Jones, 134; Rich, 77, 260

## Suspensions and Revocations.

**Ignition:** Podszus, 506; Rutharat, 529, 602

**Traction:** Brolt, Brooks & Holt, 641; Goldschmid, 546; Hildebrand & Knorr, 546

**Miscellaneous:** Vulcan Maschinenfabrik, 529, 579; Schuster & Ost, 552; Siemund, 602

# LOCAL NOTES, including "Tenders Invited and Prospective Business," and "Tenders Received and Accepted"

Aberdare, 108, 199  
Aberdeen, 40, 84, 108, 264, 500, 532  
Accrington, 27, 83, 139, 222, 248, 403, 548, 582  
Aldershot, 71, 72, 98, 413, 426  
Altrincham, 593, 644  
Antwerp, 333  
Arbroath, 247, 532, 636  
Ardee, 247  
Armagh, 247  
Ashington, 300  
Ashton-on-Lyne, 248, 300, 413, 510, 556  
Atherton, 200, 313, 581, 605  
Auckland, 299  
Australia, 13, 27, 71, 83, 123, 170, 247, 299, 313, 333, 353, 413, 425, 476, 490, 500, 510, 547, 567, 582, 605, 625, 654  
Aylesbury, 275, 391, 459  
Ayr, 110, 231

Bacup, 97, 170, 221, 333, 500, 548, 593, 644  
Ballaghaderreen, 247  
Ballyconnell, 83  
Banstead, 184  
Barford, 490  
Barking, 594  
Barnes, 108, 199, 299, 300  
Barnet, 605  
Barrow-in-Furness, 153, 354, 438, 567, 582, 644  
Barry, 184  
Barwell, 209  
Basingstoke, 13, 123, 476, 568  
Bath, 27, 231  
Batley, 593  
Beckenham, 377  
Bedford, 27, 153, 288  
Belfast, 27, 28, 40, 71, 123, 209, 221, 231, 243, 247, 275, 314, 378, 392, 437, 522, 531, 540, 567, 582, 606, 626, 654, 666  
Belgium, 231, 288  
Bexhill, 84, 122, 263, 314, 522  
Bexley, 108, 199, 263, 333  
Bicester, 313  
Bingley, 140  
Birkenhead, 97, 457, 654  
Birmingham, 13, 28, 42, 54, 97, 199, 209, 231, 248, 299, 556, 582, 635  
Bispham, 510  
Blackburn, 209, 264, 314, 426, 459  
Blackpool, 56, 72, 139, 209, 243, 247, 248, 314, 378, 547, 556, 581, 635  
Blackrock, 84, 170, 200, 221, 378, 391, 425, 532, 614  
Bognor, 154  
Bolton, 28, 83, 97, 109, 171, 333, 334, 451, 459, 500, 510, 539, 644, 654  
Bo'ness, 110  
Bootle, 97, 199, 231, 288, 299  
Bournemouth, 40, 248  
Bradford, 27, 54, 58, 426, 451, 476, 490, 567, 568  
Braintree, 72, 221, 231  
Brentford, 154, 172, 354  
Brentwood, 27, 199

Bridlington, 490  
Brierfield, 288  
Brighton, 109, 124, 139, 392, 452, 490, 510, 540, 594  
Bristol, 71, 209, 231, 248, 276, 413, 426, 437, 510, 522, 606  
Brixham, 200  
Bromley, 222, 547  
Bulgaria, 221  
Burnham, 109  
Burnley, 83, 172, 459  
Burton-on-Trent, 97, 98, 123, 221, 276, 413, 666  
Bury, 97, 288, 392, 437, 582  
Bury St. Edmunds, 170, 468, 557  
Cambridge, 139  
Canada, 27, 84, 231, 266, 425  
Cardiff, 231, 333, 452, 567  
Carlisle, 56, 108, 153, 199, 232, 289, 438  
Carnarvon, 42  
Carshalton, 557  
Cheadle and Gatley, 459  
Cheltenham, 40  
Chertsey, 477  
Cheshire, 28  
Chester, 392, 582  
Chesterfield, 556  
Chile, 476  
Chiltern, 97  
China, 425  
Chiswick, 14, 42, 98  
Chorley, 28  
Clacton, 153, 299, 459  
Clatterbridge, 500  
Cleckheaton, 288, 334, 450, 490, 510  
Cleethorpes, 299, 314, 665  
Clones, 403, 477, 490  
Cobham, 459  
Colchester, 71, 153, 625  
Colne, 83, 313  
Colombia, 522  
Colwyn Bay, 139, 184, 299, 378, 391, 476, 531, 635  
Congleton, 54  
Connahs Quay, 184, 556  
Copenhagen, 222  
Coventry, 264, 635  
Crete, 97  
Criccieth, 221, 403  
Cromer, 56  
Crook, 97, 124, 391, 413  
Crowle, 184  
Croydon, 83, 153, 334, 568, 581  
Cumberland, 108  
Darfield, 28  
Darlington, 154, 288, 403, 438  
Dartford, 109, 153, 222, 299, 413  
Darwen, 413, 426  
Deal, 210  
Dearne Valley, 139  
Derby, 153, 210, 594  
Devonport, 170, 199, 263, 275, 353, 391  
Dewsbury, 264, 532, 644  
Dorchester, 123  
Dorking, 40, 54  
Dover, 71, 98, 153, 172, 272, 354, 414, 467, 468, 510, 547, 594, 635

Dublin, 14, 40, 98, 109, 123, 170, 171, 172, 199, 209, 413, 425, 437, 467, 635  
Dudley, 110, 154, 200, 232, 582  
Dumbarton, 42  
Dundalk, 13, 54, 83, 84, 288  
Dundee, 13, 27, 28, 54, 110, 153, 231, 243, 334, 467, 522  
Dunfermline, 153  
Earsden, 459  
East Grinstead, 378  
East Ham, 264  
Eastbourne, 14, 28, 83, 84, 313, 391, 392, 437, 459, 460, 567, 636  
Eastleigh, 531  
Eccles, 98, 490, 556  
Edinburgh, 56, 98, 123, 140, 170, 184, 199, 232, 276, 288, 289, 299, 334, 403, 425, 452, 490, 522, 540, 548, 557, 567, 593, 625  
Egypt, 183  
Elgin, 140  
Ellon, 222, 288, 378  
Elv, 264, 392  
Erith, 210  
Exeter, 153, 171, 392  
Falkirk, 299, 313  
Fareham, 333  
Farnworth, 153, 199, 221, 222, 333, 437  
Finchley, 581  
Fleetwood, 531, 567, 582  
Flint, 231  
Foot's Cray, 200, 210  
France, 626  
Galashiels, 56, 172, 232, 299  
Gateshead, 97  
Gellygaer, 391  
Gillingham, 459, 556  
Girvan, 248  
Glasgow, 72, 209, 289, 299, 378, 391, 438, 460, 532, 547  
Glastonbury, 172  
Gloucester, 452  
Golcar, 248  
Government Departments, 54, 109, 123, 153, 171, 231, 275, 288, 313, 353, 476, 490, 522, 567, 582, 625  
Grassington, 438  
Gravesend, 71  
Great Harwood, 468  
Greece, 109  
Greenock, 71, 289, 644  
Greetland, 200  
Grimshy, 71, 72, 124, 314, 413, 425, 450  
Guildford, 40  
Guisborough, 231  
Halifax, 71, 153, 231, 500  
Hamilton, 510  
Harrogate, 109, 313, 425  
Harwich, 14, 40  
Haslingden, 13, 83, 490  
Hastings, 71, 354, 567  
Hawarden, 567  
Havle, 425  
Hadden Bridge, 84  
Heckmondwike, 184, 665

Hereford, 333, 459  
Hessle, 557  
Heston and Isleworth, 139  
Heywood, 264, 510, 556  
Hightown, 314  
Hinckley, 14  
Hindley, 263, 353  
Holmfirth, 84, 413  
Holyhead, 231  
Hong Kong, 654  
Hornsey, 83, 124, 183, 403, 522  
Horsham, 14, 299  
Horwich, 354  
Hove, 28, 98, 110, 200, 209, 289, 460, 548, 644  
Huddersfield, 71, 124, 299, 654  
Hull, 392  
Ilford, 84, 97, 199, 378, 400, 406  
Ilkley, 437  
India, 124, 500, 510, 636  
Inverurie, 54, 231  
Ipswich, 27, 83, 84, 109, 139, 153, 391, 593  
Ireland, 593, 625  
Irlam, 476, 567  
Irvine, 333  
Japan, 140  
Jersey, 264  
Keighley, 426, 437, 438, 522, 556, 605  
Keith, 232  
Kelso, 522  
Kettering, 109, 183, 299  
Kidderminster, 210  
King's Lynn, 264, 468  
Kingston-on-Thames, 98, 264  
Kingstown, 264, 276, 300, 460  
Kirkcaldy, 40, 288  
Knaresborough, 123, 170  
Leeds, 54, 123, 172, 199, 209, 210, 231, 275, 276, 282, 288, 299, 300, 437, 451, 476, 538, 548, 557, 606, 626, 635, 654  
Leicester, 71, 72, 522  
Leigh, 40, 83, 288, 334  
Limerick, 140, 500  
Lincoln, 231  
Littleborough, 522  
Liverpool, 71, 72, 123, 124, 153, 275, 278, 452, 476, 644  
Llandudno, 54, 665  
Llanidloes, 490  
London: Battersea, 97, 209, 437; Bermondsey, 264; Bethnal Green, 172, 605, 654; Fulham, 97, 300; Hackney, 40, 54, 153, 183, 288, 299, 404, 425, 540, 557; Hammer-smith, 71, 171, 209, 275, 276, 299, 353, 391, 403, 556, 567, 582, 614, 626; Hampstead, 172, 184, 263, 275, 288, 391, 404, 654; Islington, 28, 42, 109, 183, 300, 314, 425, 594, 625, 636; Kensington, 184; L.C.C., 83, 84, 109, 123, 139, 171, 183, 209, 210, 243, 278, 299, 353, 403, 404, 413, 414, 425, 428, 437, 450, 467, 476,

## LOCAL NOTES—(continued).

- 538, 547, 593, 625, 654; *Lambeth*, 153, 231, 452; *Poplar*, 404; *Shoreditch*, 83, 299, 532; *Southwark*, 231, 299; *Stepney*, 83, 288, 314, 437; *St. Marylebone*, 40, 124, 172, 183, 184, 222, 289, 391, 392, 540; *St. Pancras*, 40, 42, 97, 123, 124, 172, 209, 221, 276, 426, 437, 476, 500, 539, 556, 614; *Woolwich*, 183, 275, 288, 522
- Long Eaton, 266, 400, 606  
 Lossiemouth, 377  
 Loughborough, 54, 276, 414  
 Loughrea, 247, 288  
 Lowestoft, 109, 110, 124, 248, 353, 522  
 Lurgan, 14, 183, 210, 288  
 Luton, 414  
 Lynn, 378  
 Lytham, 40, 222, 232, 263, 334
- Macclesfield, 109, 124, 232, 248, 293  
 Magherafelt, 83  
 Maidenhead, 452  
 Maidstone, 289, 539, 548, 557, 593, 594  
 Malton, 221  
 Malvern, 153, 154, 221, 313, 500  
 Manchester, 13, 40, 42, 56, 83, 97, 123, 139, 140, 153, 154, 183, 184, 200, 209, 221, 248, 264, 275, 276, 314, 316, 333, 334, 353, 354, 403, 413, 414, 460, 466, 490, 500, 510, 539, 593, 594, 625, 626, 636, 666  
 Mansfield, 13, 282  
 Mayo, 626  
 Merthyr Tydfil, 123  
 Mexborough, 221  
 Middlesbrough, 124, 209, 378, 614  
 Middleton, 209, 354, 460, 644  
 Midhurst, 500  
 Minster, 467  
 Mold, 459  
 Monmouth, 40, 42, 153, 500  
 Morcambe, 378
- Nairobi, 333  
 Nelson, 13, 97, 300  
 Netherlands, 139  
 New Zealand, 27, 40, 56, 108, 139, 221, 288, 299, 353, 425, 547, 593  
 Newcastle-on-Tyne, 288  
 Newcastle-under-Lyme, 644  
 Newfoundland, 71
- Newmarket, 567  
 Newport, 71, 109, 184, 231, 437, 450, 467  
 North Skelton, 183  
 Northampton, 109, 231  
 Northwich, 184  
 Norwich, 71, 247  
 Nottingham, 184, 209, 314  
 Nuneaton, 97, 199, 314
- Oban, 123, 522  
 Oldham, 56, 248, 288, 377, 394, 413, 426, 437, 438, 467, 522, 557, 567, 594, 625
- Pembroke, 123  
 Penketh, 248  
 Penmaenmawr, 42  
 Peterborough, 28, 83, 199, 626  
 Pickering, 333, 557  
 Plymouth, 27, 110, 199, 313  
 Pontypridd, 71, 231, 556, 626, 636  
 Port Glasgow, 438  
 Port of London Authority, 626  
 Portishead, 532  
 Portrush, 459, 490, 500, 626  
 Portsmouth, 314, 468, 654  
 Preston, 124, 247  
 Pwllheli, 42
- Queenstown, 248
- Railways: G.C., 109; L. & N.W., 171, 209; L. & S.W., 97; L. & Y., 123; Mid. of Ireland, 71  
 Rangoon, 275  
 Rathkeale, 199  
 Rathmines, 13, 40  
 Rawtenstall, 123, 153, 199, 247, 377, 605  
 Redditch, 42, 98, 222, 299, 391, 413, 438, 625  
 Reigate, 184  
 Rhondda, 83, 353  
 Rhyl, 27, 109  
 Rhymney, 605  
 Richmond, 314  
 River Plate, 567  
 Rochdale, 97, 110, 171, 183, 199, 377, 425, 467  
 Rochester, 353, 510, 539  
 Rotherham, 27, 123, 263, 289  
 Rugby, 71, 377, 378, 666  
 Ruislip-Northwood, 153  
 Russia, 27, 313, 581  
 Ruthin, 221
- Saddleworth, 222, 300
- Salford, 27, 54, 97, 123, 231, 299, 353, 392, 437, 451, 547, 556, 665  
 Scarborough, 72, 222, 276  
 Selby, 614  
 Shanghai, 83, 282, 288, 665  
 Sheffield, 413, 414, 490, 510, 540, 594, 644  
 Shipley, 40  
 Shrewsbury, 378  
 Skelton, 199, 275, 353  
 Skipton, 532, 581  
 Slaithwaite, 625, 626  
 Sleaford, 500  
 South Africa, 54, 83, 109, 153, 171, 221, 313, 413, 425, 450, 500, 547, 581, 593, 644  
 South Shields, 27, 153, 183, 231, 477  
 South Wales, 109  
 Southampton, 13, 72, 84, 109, 124, 170, 183, 184, 209, 426, 542, 510, 548  
 Southend, 97, 183, 500, 532  
 Southport, 40, 124, 140, 172, 377, 392, 451, 452, 547, 567, 644  
 Spain, 231, 490, 593  
 Springhead, 468  
 St. Albans, 231  
 St. Anne's-on-Sea, 500, 532  
 Stafford, 14, 123  
 Stalybridge, 310, 333, 437  
 Stamford, 500  
 Stirling, 72, 110, 172, 243  
 Stockport, 172, 231, 275, 288, 531, 665  
 Stockton-on-Tees, 83, 300, 313, 593  
 Stoke-on-Trent, 13, 140, 425, 451, 532, 581, 593, 625, 654  
 Street, 153  
 Stretford, 97, 333, 413  
 Sunderland, 84, 199, 275, 288, 313, 314, 333, 459, 500, 510, 644  
 Surbiton, 56, 426  
 Swansea, 13, 42, 97, 124, 154, 183, 184, 354  
 Sweden, 247, 353  
 Swindon, 153, 232  
 Swinton and Pendlebury, 153, 288, 467, 522, 556
- Tasmania, 54, 477  
 Taunton, 56, 83, 232  
 Teignmouth, 56, 333, 547  
 Tonbridge, 184  
 Torpoint, 140, 222, 314  
 Torquay, 153, 209, 221, 275, 500, 510, 635, 644
- Trebizond, 299  
 Troon, 522  
 Truro, 110, 353, 378, 391, 594  
 Tunbridge Wells, 209, 276, 299, 538, 556, 625, 626, 636  
 Turkey, 27  
 Turton, 222, 413, 556, 635  
 Tynemouth, 72
- Uxbridge, 644
- Virginia, 171
- Wakefield, 40  
 Wallasey, 199, 275, 353, 354, 391, 437, 451, 477  
 Walmer, 210  
 Walsall, 40, 153, 199, 231, 275, 314, 377, 391, 425, 450, 451, 510, 532, 547, 557, 567, 626  
 Walthamstow, 97, 110  
 Warrington, 109, 171, 199, 391, 413, 452, 490, 500, 510, 532, 539, 605  
 Waterford, 172, 556  
 Watford, 288, 614  
 Wednesbury, 222, 450, 644  
 Wellington (Salop), 314  
 West Bridgford, 14  
 West Bromwich, 209, 263, 334, 403, 547  
 West Ham, 13, 54, 109, 333, 426, 522, 614, 636  
 West Hartlepool, 97, 231, 314  
 West Riding, 567  
 Weymouth, 644  
 Whitefield, 510  
 Whitehaven, 171  
 Whitstable, 42  
 Whitworth, 531  
 Wigan, 199  
 Willesden, 391, 593, 606, 614  
 Wimbledon, 110, 414, 476  
 Winchester, 539, 614  
 Wolverhampton, 40, 54, 247, 426, 438, 500, 522, 606, 626, 654  
 Wood Green, 84  
 Worcester, 56, 110, 172, 209, 231, 314, 327, 333, 614  
 Wormit, 110  
 Wrexham, 83, 231, 313, 403, 594  
 Wye, 184
- Yarmouth, 109  
 York, 27, 83, 209, 263, 333, 354, 403, 413, 460, 510, 522, 532, 539  
 Yorkshire, 56, 71, 154, 626

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, Etc.

- A.E.G., 14, 636, 655  
 Anglo-Argentine Trams., 78  
 Aron Meter, 378, 392, 636  
 Ascot Elec., 110  
 Auto. Tel. Mfg., 159
- Babcock & Wilcox, 221  
 Barcelona Lgt. & Pwr., 414  
 Bastian Meter, 140  
 Birmingham Power & Trac., 333  
 Bournemouth & Poole Sup., 124, 468  
 British Aluminium, 532  
 British Columbia Rly., 24  
 Brit. Elec. Federation, 333  
 British Elec. Trans., 124, 154, 532, 553  
 British Insulated, 140, 172, 532  
 B.T.H., 276, 300  
 British Westinghouse, 200, 210  
 Bromley (Kent) Power & Lgtg., 532  
 Brown Boveri, 666
- Bruce Peebles, 124  
 Brush, 221, 232
- Calcutta Trams., 248  
 Callender's Cable, 264, 289, 568  
 Chloride Elec. Storage, 264, 626  
 Cleveland & Durham Power, 184  
 Clyde Valley Power, 200, 532  
 Coalite, 392  
 Companies Struck off Register, 110, 123, 183, 222, 557, 594, 606  
 Consolidated Diesel Engine, 378, 404  
 Constantinople Telephones, 109, 117, 642  
 County of Dorset Engs., 438  
 County of Durham Power, 532  
 Craigpark Cable, 276  
 Crompton, 184, 404, 414
- De Forest Wireless, 313  
 Dick Kerr, 557  
 Drake & Gorham, 557  
 Dublin Trams., 78
- E.C.C., 54, 276, 314, 626  
 Edison & Swan, 594, 614  
 Edmundsons', 404  
 Elec. & Gen. Investment, 378  
 Elec. Apparatus, 264  
 Elec. Distn. of Yorks., 110  
 Ericsson, 149, 184
- Fife Lgt. & Power, 140  
 Folkestone Sup., 172
- G.E.C., 210, 221, 378, 404  
 German Edison, 42  
 Glover, 124, 184
- Harrow Lgt. & Power, 172  
 Henley's, 110, 154, 468  
 Holophane, 14  
 Hove Lgt., 140, 172
- I.R. & G.P., 666
- Johnson & Phillips, 232, 248
- Kent Power, 276
- Lancs. Power Construction, 300  
 London Elec. Rlys., 117  
 London Elec. Trading, 248  
 London & Sub. Trac., 172  
 London Supply Cos., 110, 124, 140, 200, 210, 452, 460
- Madras Elec. Sup., 314  
 Marconi, 63, 217, 375  
 Mather & Platt, 110  
 Melbourne Sup., 72, 184  
 Met. Elec. Sup., 594  
 Mid. Power Distn., 172  
 Mirlees Watson, 172
- Nairobi Power & Lgt., 333, 414, 532

National Elec. Cons., 460, 477  
Newcastle & Dis. Lgtg., 477  
Newcastle Sup., 124, 172, 438  
N.E. Power Cos., 140  
North Met. Sup., 140, 172

Otis Elevator, 392  
Oxford Elec., 172, 532

Power Gas, 666  
Premier Control, 140

Richardsons, Westgarth, 184

South London Sup., 532  
South Met. Lgt., 172, 468  
South Wales Distn., 221

Trafford Power & Light, 392  
Tyneside Development, 468

Urban Elec. Sup., 184

Vickers, 172, 200  
Victoria Falls, 84, 378, 414

Waste Heat, 124, 140, 468  
Waygood, 264, 300, 378  
White, J. G., 378, 392  
Willans & Robinson, 232  
Woking Elec. Sup., 248

Yorkshire Power, 98, 110, 438, 460

## NEW COMPANIES

Alexandra Elec. & Engng., 72  
Argentine Elec., 248

Bachelet Levitated Rly., 438  
Barnsley Smokeless Fuel, 352  
Beuttell, A. W., 248  
Bishop's Castle Lgt., 184  
British Elec. Exports, 594  
Brit. Willard Battery, 378  
British Cent. Elec., 56  
Brit. Elec. Accumulator, 438  
Brough Elec. Ltg., 378

Carleton Elec., 72, 222  
C.E.A.G. Miners' Sup., 606  
Chipping Norton Elec. Sup., 248  
City of Freetown (Sierra Leone) Sup., 606  
Colston Elec. Works, 56

"Dac" Accumulator, 460  
Derby Lamp Works, 568  
Dorman & Smith, 124

E.M.F., 222  
Economic Elec., 438  
Elec. Finance and Securities, 378  
Elec. Floor Machine, 378  
Elec. Sales Promotion, 438  
Elec. Services, 56  
Electro-Bleach, 184  
Electro-Steel Foundries, 378  
Electromobile (Leeds), 460  
Evans & Son, 568

Gifkins, A. V., 568  
G. M. Wireless, 378

Hemming Conduit Grip, 378  
Highfield, 568

Indian Railless Tract., 56  
Irish Lgt. & Power, 72  
Irish Telephone, 124

Lombard, Rogers & Crooks, 222  
Ltg. Sup., 140

Manchester Cable, 354  
Mid. Elec. Blowing, 140

Nitrate Heating and Power, 354  
North Brit. Welding, 124, 568

Park Royal Eng., 354  
Pernambuco Telephone, 399  
Phoenix Elec. Heating, 568

Premier Valve, 248

Sceando Lamp, 124  
Scottish Welding, 354  
Simplex Self-Starters, 568  
Small Elec. Motors, 606

Transiso Syndicate, 248  
Trans-Oceanic Wireless, 56  
Tubex, 248

Venner's Heating and Cooking, 248

United States Railless Trac., 378, 438

Waygood, 124  
Wireless Press, 460



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 366 [VOL. X., No. 1]

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THURSDAY, JANUARY 1, 1914.

[PRICE ONE PENNY]

Registered as a Newspaper.

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLOQUIAL ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Otreling, Fleet, London."

Telephone No.: 5509 Holborn.

Orders to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

We give some particulars of the way in which the electric supply and tramway services in Leeds were kept going during the strike. (Page 2.)

THE annual report of the Chief Inspector of Mines for 1912 records a diminution in the number of electrical accidents below ground, notwithstanding the increased use of electrical apparatus. (Page 3.)

SOME particulars of the electrical equipment of a small mine in Illinois are given. (Page 4.)

A DESIGN of lighting transformer for use underground is described and illustrated. (Page 4.)

THE patent specifications published during December of special interest to mining electrical engineers include one relating to the construction of coal-cutters and several relating to safety lamps. Electrometallurgists will also be interested in a number of patents dealing with electric furnaces, magnetic separators, and the production of metals. (Page 5.)

SOME miners' safety lamps were described by Mr. H. H. Clark, of the United States Bureau of Mines, in a recent lecture. (Page 5.)

AFTER two years' working, the 1,200-volt motors of the Leyden Katwijk direct-current railway are as good as new, and are working with the original brushes. Trouble was at first experienced with the switchgear, and it is found that porcelain is the only satisfactory insulator at this pressure. The 1,200-volt overhead conductor is carried through the streets of Leyden with tramway construction, and no serious accidents have occurred. (Page 6.)

AN International Electrical Congress is to be held

**BINDING "ELECTRICAL ENGINEERING."**—Vol. IX. of "Electrical Engineering" (Jan.—Dec. 1913) closed with our issue of December 25th, 1913. Readers can have their volumes bound by their own bookbinder; or, they may send their numbers to THE KILOWATT PUBLISHING CO., LTD., Temple Chambers, London, E.C., carriage paid (with the reader's name and address), and a remittance of 4s. 6d. under separate cover. The volumes will then be bound and returned carriage paid to any address in the United Kingdom, or carriage forward to the Colonies or abroad. Binding Cases (including index, but not including binding) 2s. each, or post free 2s. 4d. (Abroad 2s. 6d.) Index alone, 1d. (Post free 2d.).

at San Francisco in 1915 after the meeting of the International Electrotechnical Commission. (Page 6.)

A WATER-POWER scheme involving some 380,000 h.p. from several different sites and a 110,000-volt transmission system is in course of development in Spain. (Page 7.)

A PAPER read by Mr. T. Thorne Baker before the Society of Arts dealt with the effects of electricity on animal and plant life. Experiments were described in which electricity had been used to invigorate plant growth, to destroy blight, to kill cheese mites, and to accelerate the development of chickens in incubators. (Page 7.)

THE light distribution curves of a 2,000 c.p. "Nitra" half-watt tungsten lamp under different conditions are given. (Page 8.)

THE advantages of high and low amounts of reactance in turbo-alternators are discussed in our Questions and Answers columns. (Page 8.)

WE refer to the tramway and trolley 'bus schemes to be promoted next session in Parliament, and to one or two novel uses to which they are to be put.—The London, Brighton & South Coast Railway Co. is asking powers to take current from any electric supply authority upon its suburban lines. (Page 9.)

SEXTUPLE Baudot telegraph working is being introduced between London and Birmingham. The Baudot system is also to be used between London and Liverpool and Glasgow.—The new Anglo-Irish telephone cable is now available for use by the public between London, Manchester, Liverpool, and Ireland.—Telephonic communication between London and Basle, Geneva, and Lausanne is available from to-day. (Page 9.)

THE specifications published by the Patent Office last week include one by R. Pohl and Phoenix Dynamo Mfg. Co. describing how the D.C. pressure of a rotary converter may be adjusted through a booster which is also used as a starting motor. H. J. Dowsing and D. Huntley describe a new type of flexible heating element. The grant of a patent to Pope's Electric Lamp Co. for drawn tungsten filaments is opposed. (Page 10.)

A LIGHTING installation in a London printing works is described, and a new form of controller is illustrated. (Page 12.)

A 5,000 kw. turbo-alternator, condensing plant, rotary converter, and transformer is required at Dundee; water coolers at Manchester; sub-station plant at Haslingden; electrical supplies at Birming-



ham, and motors and starting switches at Swansea.—Loans of £12,160 and £14,000 are contemplated at Rathmines and Basingstoke.—A street arc lighting scheme is being prepared at Stoke-on-Trent, and a large quantity of electrical apparatus, including cable and electric clocks, is required by the Australian Postmaster-General. (Page 13.)

THERE was a serious interruption of supply at Eastbourne last week. (Page 14.)

AFTER a twelve months' trial, the Dublin Corporation has adopted G.E.C. and J. & P. arc lamps for street lighting purposes.—The Chiswick Corporation has decided to work the local electric lighting undertaking when it has been purchased.—A special tariff for internal lighting applicable to consumers using lamps for external lighting has been instituted at Stafford. (Page 14.)

A VERY satisfactory year's business is reported by Holophane, Ltd., and the A.E.G. (Page 14.)

### THE LEEDS STRIKE

WE referred in our last issue to the collapse of the strike of municipal workers in Leeds, but a few notes on the situation as regards the electric supply and tramway services may be of interest. In the case of the electric lighting department, the enginemen and firemen returned to work in a body on Christmas Day, which, of course, practically restored the works to the normal footing, and enabled the Department to dispense with the assistance, which had been so valuable, of the University students and other volunteers. The brunt of the work, of course, had fallen upon the station engineers and those from other branches of the Department's work, such as the Drawing Office and Distribution Department, the officials and loyal workmen from those Departments tackling the unaccustomed duties of stoking, coal-trimming, &c., very effectively. The strikes have brought out the necessity of a loyal official and clerical staff. In the case of tramways, for example, no man who superintends any work such as an inspector, timekeeper, depôt inspector, &c., should be a member of any union. They are thus not bound by any resolution of such union, and should be loyal when a strike is declared by any of the men's unions. In Leeds the strike, as far as the tramways was concerned, was purely sympathetic, no request for any advance being asked by any of the uniform men. A small section who were employed in the repair of the permanent way are members of the Gasworkers' Union, which made the demand, but all the other classes of labour went on strike in sympathy to enforce the demand of the gasworkers. These included blacksmiths, machinemen, fitters, turners, coachbuilders, joiners, painters, plumbers, bricklayers, paviors, enginemen, firemen, power station labourers, and motormen and conductors. Owing, however, to the loyalty of the timekeepers, inspectors, &c., and of the clerical staff, the management were enabled to gather together and encourage a comparatively small number of the motormen and conductors who were willing to turn out on the first morning on which the strike was declared. These men, whose addresses had already been taken, were assisted to the depôts in motor-cars. Adequate protection by the police was arranged, and no difficulty whatever was experienced in starting on the first day a service of about 25 to 30 per cent. of the ordinary regular cars. A marked feature of the whole strike in every department has been the enforced good behaviour of the strikers, who were in almost every case confined to "peaceful persuasion."

Each day it was possible, with the assistance of the staff, to run sufficient plant at the tramway power station between daylight and dark to keep the number of cars referred to in operation. As each day passed the number of cars was augmented, until by the fourth or fifth day a very large number of the men returned to duty. It was then possible to increase the power station staff, and by the end of the week the service had resumed its normal proportions. There is no doubt that the action of the tramways broke the back of the sympathetic strike, in which close on 5,000 municipal employees were engaged. Immediately following the stand taken by the tramways, the men in the Waterworks Department, City Engineer's, Highways, Cleansing, and Gas Departments began to return to work. The Special Committee of the Council, which had been formed with the full powers of the Council, have shown great leniency in giving all the previous employees an opportunity of returning before the vacant positions were filled up. To-day it is three weeks since the first portion, viz., the gasworkers, came out on strike, and at the present moment practically the very fullest requirements of the city with regard to gas are being provided. It should be added that more than anything else the public spirit of the citizens, who were against the strikers almost to a man, no doubt rendered the efforts of the various departments to re-establish the service more easy.

### A HAPPY NEW YEAR



### ARRANGEMENTS FOR THE WEEK

#### FRIDAY, JANUARY 2ND.

*Electro-Harmonic Society.*

8 p.m. Smoking Concert at Holborn Restaurant.

#### SATURDAY, JANUARY 3RD.

*Association of Mining Electrical Engineers.*

5.30 p.m. Warwick and S. Staffs Branch. At Imperial Hotel, Birmingham. "The Choice of Electrical Machinery for Use in Mines," by J. P. C. Kivlen.

#### MONDAY, JANUARY 5TH.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College. "The Electrical Equipment of Collieries," by H. S. Ripley.

#### TUESDAY, JANUARY 6TH.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "D.C. Power in the Machine Shop," by E. Blackmore.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. Meeting at Royal Technical College, Glasgow.

#### WEDNESDAY, JANUARY 7TH.

*Royal Society of Arts.*

5 p.m. Juvenile Lecture I., by R. P. Howgrave-Graham, on "Electric Vibrations and Wireless Telegraphy."

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At the University. "The Development of Electric Power for Industrial Purposes in India," by H. R. Speyer.

*Batti-Wallahs' Society.*

7.30 p.m. Informal Evening at Victoria Mansions Restaurant.

#### THURSDAY, JANUARY 8TH.

*Institution of Electrical Engineers.*

8 p.m. "British Practice in the Construction of High-Tension Overhead Transmission Lines," by B. Welbourn.

### The London Electrical Engineers.

MONDAY, JANUARY 5TH.—A. Company. Technical Instruction, 7 to 10 p.m.  
TUESDAY, JANUARY 6TH.—B. Company. Technical Instruction, 7 to 10 p.m.  
WEDNESDAY, JANUARY 7TH.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m.  
THURSDAY, JANUARY 8TH.—C. Company. Technical Instruction, 7 to 10 p.m.  
FRIDAY, JANUARY 9TH.—D. Company. Technical Instruction, 7.30 to 9.30 p.m.  
Special Class on Crossley Engine, 7 to 8 p.m.  
SATURDAY, JANUARY 10TH.—Headquarters open from 10 a.m. till noon.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### ELECTRICITY IN MINES IN 1912

THE second part of the general Report of the Chief Inspector of Mines for 1912, which has just been issued contains several references to the extended use of electricity, including the report of Mr. R. Nelson, Electric Inspector of Mines, who states that electricity was newly introduced into 56 mines (including 31 cases in Scotland) in 1912, as against 46 in 1911, and 40 in 1910. The total horse-power of motors is given as 510,756, of which 316,667 were in use underground.

#### Electrical Accidents.

There were twelve fatal electrical accidents involving fourteen deaths during the year; one was due to ignition of fire-damp by electricity and the rest to electric shock. The corresponding fatalities during 1911 were also twelve in number, and involved twelve deaths. The ignition of fire-damp referred to was at Bedwas Colliery, near Newport, on March 27th, when three men were fatally burned. The spark which caused the fire was from an electric bell used for signalling, and after describing the circumstances Mr. Nelson remarks that it was the first recorded occurrence of the kind, and draws attention to regulation 132 of the General Regulations, which reads:—

"In any part of a mine in which inflammable gas, although not normally present, is likely to occur in quantity sufficient to be indicative of danger, the following additional requirements shall be observed:—(1) All cables, apparatus, *signalling wires* and *signalling instruments*, shall be constructed, installed, protected, worked and maintained so that in the normal working thereof there shall be no risk of open sparking."

Several manufacturers have placed on the market signalling apparatus which, in his opinion, fulfil adequately the above requirements.

Of the eleven electric shock accidents above referred to four took place on the surface and seven below ground. The latter figure is lower than it has been since 1906.

Of the four surface accidents, three occurred on medium-pressure alternating-current systems, and the fourth on a medium-pressure direct-current system. Two appear to have been due to working improperly on live apparatus with the full knowledge that the apparatus was live; the other two to misadventure in making contact with live parts. In one of the latter cases the victim made accidental contact with a bare trolley wire in boarding a charging machine from the top of a battery of coke ovens. In the other the victim made accidental contact with a live switch in allowing his hand to rest vaguely on the switchgear controlling a haulage motor of which he had charge. This last was the accident which occurred on a medium-pressure direct-current system; the three first described were on medium-pressure alternating-current systems.

Of the seven underground accidents, one occurred on a high-pressure three-phase alternating-current system, five on medium-pressure three-phase alternating-current systems, and the remaining one on a medium-pressure direct-current system. Three of these were due to absence of earthing of outer coverings of apparatus, and the remaining four were due respectively to inefficient earth connection; direct contact with a live cable exposed through abrasion of the insulation; contact with a girder made live by its contact with a live cable exposed through abrasion of the insulation; and accidental contact with uninsulated live parts of apparatus. Of the accidents on three-phase systems, five were on completely insulated systems and four on systems with the neutral point earthed. Of the eleven fatal electric shock accidents, three occurred to trained electricians, three to coal-cutter attendants, and one each to a coke-oven attendant, a coal hewer, a fireman, a siding attendant, and a motor driver. Of the non-fatal electrical accidents, one was a case of fire-damp ignition, attributed to a spark from an electric bell, at Caerpontpren Colliery, Pontyates, South Wales. Two underground fires were also reported to have been due to electricity in 1912.

The first took place at the Windsor Colliery, Abertridwr, South Wales, on July 30th, but it is reported that no damage was done. The fire was due to the overheating of a resistance grid, which ignited the insulating material on a cable leading

to it. The fire was quickly extinguished. The second fire occurred on October 21st at Bowhill Colliery, Fife, Scotland. In this case a three-core bitumen insulated armoured cable "burst into flame" at a joint. Some pit props, which had in fact been placed on the cable to protect it during "brushing" of the roof, caught fire, and it was some time before the fire was overcome. It was thought that a large stone had previously damaged the joint by falling on it.

Thirty-six non-fatal electric shock accidents causing injury to thirty-six persons were reported during 1912, thirty-three in coal mines and three in metalliferous mines. In many cases the accidents were trifling in their results, but in four cases the victim was unconscious for some time. In one instance complete unconsciousness continued for half-an-hour, and artificial respiration had to be continued for a very long period before the victim fully recovered. A number of instances of successful resuscitation continue to be reported every year.

References to electrical matters also occur in other parts of the report. From the general tables of accidents it would appear that the electrical underground fatal accidents were confined to the Scottish, Northern, Yorkshire and Midland districts, and those on the surface to the Northern, Yorkshire and South Wales districts. The underground electrical fatalities were 0.5 per cent. and the surface fatalities 0.3 per cent. to the totals from all causes. The corresponding average figures for the last five years were 0.9 per cent. and 0.2 per cent.

There were nine prosecutions of officials and seven of workmen for contravention of the electrical regulations, and fines totalling £23 5s. were inflicted.

#### Coal Cutters.

Full statistics are given as regards the use of coal-cutters. Of the total of 2,444 in 626 different collieries, 1,134 (of which 593 were in Scotland and 290 in the Yorkshire district) were electric, against 1,310 driven by compressed air. In the preceding year 998 were electric and 1,148 compressed air. The electrical cutters include 623 disc machines, 345 bar machines, 148 chain machines, 14 percussive machines, and 4 rotary heading machines. The total mineral cut by electricity was nearly 12 million tons, against about 8½ million tons by compressed air.

#### Electric Safety Lamps.

There are some interesting statistics regarding the use of electric miners' lamps. At the end of the year in question there were 10,727 in use, as against only 4,298 a year before. These were distributed as follows:—Scotland, 286; Newcastle, 1,528; Durham, 3,577; York and North Midland, 4,609; Manchester and Ireland, 371; Liverpool and North Wales, 204; South Wales, 71; Midland and Southern, 81. They were of the following makes:—Gray Sussman, 8,381; C.E.A.G., 1,418; Pape, 202; Oldham, 347; other makes, 379.

Of the total of 749,177 lamps of all kinds, 354,974 were ignited electrically and 250,095 had magnetic locks. With regard to the testing of safety lamps it is recorded in another part of the report that the failures of electric lamps have all been due to lack of candle power at the beginning or more generally at the end of a nine-hour run. In certain cases small constructional alterations have had to be made to lamps originally submitted in order to meet requirements. In some instances new batteries were submitted for the tests which had not developed their full capacity, while in others inferior or uneven bulbs were put forward, so that the first tests have on several occasions ended in failure.

**Electric Blasting in South African Mines.**—A discussion on the system of electrically firing large numbers of shots from one station, which is being experimented with in the Rand mines, was held recently by the South African Institute of Electrical Engineers. One member said that firing all the shots simultaneously shook up the ground too much, but Mr. J. H. Rider pointed out that although the ignitions were simultaneous, time fuses of different lengths could be fitted so that the explosions took place one after another. Mr. J. S. Ross explained that this was ordinarily done; it was only in shaft sinking that all the charges were fired together. The great advantage of the system was that all the men could be out of the mine when the shots were fired, and much danger avoided. Several other speakers enlarged on the safety of the system and the smaller number of misfires.

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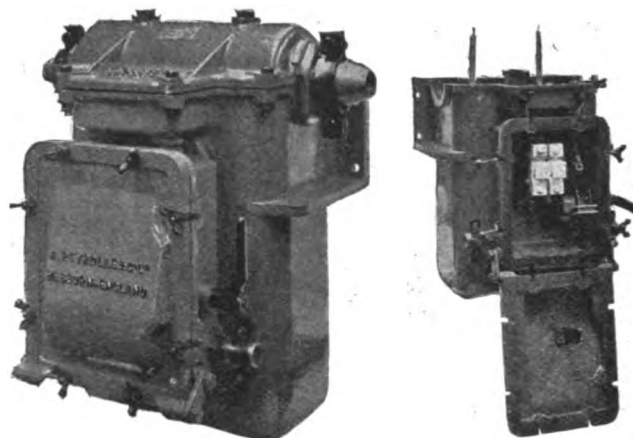
### COAL MINING IN CENTRAL ILLINOIS

COMPLETE electrical driving has been in use in the O'Gara coal mine in Sangamon County, Illinois, for the past few months. According to the *Electrical World* (New York), energy is supplied over a 6,600-volt three-phase transmission line to the motor load of 405 h.p. All the wiring is run in conduit. The mine is fairly dry and practically devoid of dangerous gases, but faults in the structure of the earth are prevalent, and the shafts are lined with concrete to prevent slides. There are two vertical shafts, one of which is used for winding coal. Each shaft has a 216 cub. ft. sump pit, and both are emptied by a single automatic two-stage centrifugal pump direct connected to a 220-volt three-phase squirrel-cage motor running at 1,700 r.p.m., and capable of delivering 50 gallons per minute. This is run for about one hour each day. Coal is raised from a depth of about 300 ft., and a maximum rope speed of 800 ft. per min. is obtained. The cage can carry from 1½ to 2 tons, and the two cars are balanced on the opposite end of the winding ropes, and are driven by a 150-h.p. induction motor with round rotor through single reduction herringbone gearing. It takes eight seconds to accelerate the cages to full speed; eleven seconds are allowed for uniform motion, five seconds for retarding, and six for dumping and caging. A locomotive taking direct current from a 270-volt trolley wire fed from a 100-kw. rotary-converter brings the coal from the coal face to the bottom of the shaft. The locomotive can pull a load of 8 tons. The coal is then raised 30 ft. above the ground, as already mentioned, and dumped into shaker screens 8 ft. wide, 2 ft. deep, and from 12 ft. to 25 ft. long. These are driven by a two-speed squirrel-cage motor. Ventilation is effected by a fan geared to a 50-h.p. two-speed squirrel-cage motor. It is run at full speed while work is progressing, and at other times at half speed.

**Electricity in Mines in South Africa.**—A report recently issued on the mineral industries of South Africa for 1912 mentions that of 411 coal-cutting machines, only 25 were driven electrically. There were during the year under review 14 accidents attributed to electricity, of which 11 were fatal. Six of the fatal cases occurred below ground and five on the surface.

### LIGHTING TRANSFORMERS FOR USE UNDERGROUND

THE accompanying illustrations show a form of transformer which has been specially designed by A. Reyrolle & Co., Ltd. (Hebburn-on-Tyne), for underground use, provided with a cast-iron switch fuse-box with wide machined metal-to-metal joints, sufficiently strong to withstand the maximum pressure inside by the ignition of any mixture of gas and air. The device is thus explosion-proof. The transformer is made suitable for attaching to a main cable and avoiding the use of fuses or switches on the primary side. The top part of the apparatus forms a cable joint-box, and tappings are taken through the connections therein to the



UNDERGROUND TRANSFORMER COMPLETE WITH SEALING-BOX FUSES AND SWITCH.

primary windings of the transformer, the whole being sealed up in a compound. The box, with a hinged lid, contains a single-pole switch interlocked with the lid, and two single-pole ventilated self-aligning porcelain fuse handles. The arrangement for sealing the ends of the main and secondary cables which pass through the apparatus consists of brass glands with clamps for making contact with the armoring. Cone glands are supplied in other designs for this purpose.

**Electric Miners' Lamps.**—At a dinner of the staff of the Tredegar Iron and Coal Co. at Cardiff on December 13th, Mr. A. Lawrence, one of the Directors, who was in the chair, said that the introduction of the electric lamp was a step in the direction of the prevention of disasters.

**Electric Winding.**—In the course of a Paper read before the East of Scotland Branch of the Association of Mining Electrical Engineers at Dunfermline last month, Mr. J. Gillespie, of the Pumpherstone Oil Co., expressed the opinion that there was no rival in the field which could bear comparison with electricity for economy and general adaptability, and it was no uncommon thing to find it in use at every operation about a colliery which could be cheapened or facilitated by means of applied energy. He was not so much in favour of electricity for main-shaft winding, and said that the retention of steam for the purpose rendered exhaust steam turbo-generators available from which electric power for the other work of the mine could be obtained economically.

**Electrical Mining Fatalities.**—At Foleshill last week an inquiry was opened into the death of G. O. Randle, assistant electrician at Exhall Colliery, on December 22nd. The deceased was splicing a cable when by some means the circuit was made alive, and he received a fatal shock. Artificial respiration was tried for three hours unsuccessfully. The inquest was adjourned until to-day.

In another accident on December 3rd, near the No. 3 pit of the United Collieries at Carfin, a young man named Ormonde, who was engaged on repairing telephone wires, received a fatal shock, owing to one of the telephone wires coming into contact with a high-tension power wire, and a portion of it also touching a wire fence upon which the man had his hand.

On December 11th an inquiry was held at Dunfermline into the circumstances attending the death of W. Laurenson on Oct. 31st in the Mary Pit, Lochore, from shock received by coming into contact with a girder which was touched by an abraded lighting cable. It appeared from the evidence that the girder had settled and cut into the cable in question. Mr. R. Nelson (H.M. Electrical Inspector of Mines) expressed the opinion that too high a voltage was used for lighting, and finally the jury made the following recommendations:—(1) That the present high voltage should at once be reduced; (2) that in exposed and dangerous places the cable should be so constructed as to prevent an accident such as had occurred; (3) that officials who were likely to be required should receive instruction which would help to prevent accident.

## ELECTRICAL MINING AND METALLURGICAL PATENTS OF DECEMBER

THE following specifications published by the Patent Office during the month of December are of particular interest to electrical mining and metallurgical engineers:—

No. 6,627, of 1913, by Beckett and Anderson and R. C. Anderson, of Glasgow, deals with the construction of electrically-driven coal-cutters in which a single motor is used both for driving the cutting element and for propulsion. The motor armature is on a horizontal shaft between two bearings, while a second horizontal shaft in axial alignment with the first is supported by a single bearing situated between a bevel pinion and one element of a clutch, the other element of which is carried on the adjacent end of the armature shaft. The bevel pinion continually drives the cutter through gearing.

In specification No. 28,772, of 1912, P. Rosenberg (Berlin) describes how, in a miners' safety lamp, by a particular construction of the outer part of the cover, a more effective distribution of light is produced than is the case with lamps of ordinary construction. The lamp bulb is contained in a receptacle having a positive closure controlled by a magnet, and having the surface inclined at about 45° by a part connected to a bayonet closure so as not to obstruct the light in a downward direction. In specification 6,700, of 1913, it is shown by P. Wolf (Friemann & Wolf, of Zwickau, Saxony) how the bulbs in safety lamps may be conveniently fixed and removed by removing only the battery holder. This is effected by a special design of lamp bulb and base plate having spring contacts. F. Palmer, of Wellington, New Zealand, describes a semi-portable lamp for mines in specification No. 27,714, of 1912. In order to provide that the lamp compartment may be situated at any distance from a closed chamber containing the switch contacts, the two are connected by a flexible tube holding the leads and allowing the passage of air. The switching is effected by air pressure acting on a diaphragm in the closed chamber. Should the tube or the glass of the lamp chamber be broken, the air will escape and so break the circuit by allowing the diaphragm switch to open.

Specification 17,261, of 1913, by H. J. von Klaeden, of Breslau, Germany, covers the use of a cable for firing explosive charges in which one wire is not interrupted, while the other is composed of sections adapted to be connected by plug contacts so that all connecting points are mounted in series.

The following specifications, also published during December, are of special interest to electro-metallurgists. In No. 22,723, of 1913, E. Stassano (Turin) gives an improvement to permit of the furnace chamber of an arc furnace being adjusted by hand, as well as by motor, in order to regulate the height of its tap hole for casting purposes. A sliding pinion on the furnace shaft may be moved by pedal control into engagement with another wheel connected to the hand-wheel. In 22,724, of 1913, the same inventor gives a method of mounting the electrodes so that the wall of the furnace chamber may be cooled by circulating water without the need for any play being provided in the aperture through which the electrode has passed. In specification No. 2,577, of 1913, A. Helfenstein (Vienna) describes a furnace with electrodes passing through an imposed charging receptacle having the distinguishing feature that inside the charging receptacle above the charging opening gas chambers are constructed on the sides, through which the reaction gases ascending from the furnace are drawn off. The packing of these chambers against the ingress of air from above is effected by the column of mixture situated above. The charging of arc furnaces is also dealt with by Helfenstein Elektro-Ofen Ges., of Vienna, in specification No. 9,590, of 1913. The furnace has upper charging chutes arranged above joint hearths, so that the charging material forms the shortest electrical connection between the electrodes. The chutes are arranged between the upper pairs of vertical electrodes. The intermediate spaces, through which the electrodes pass, are utilised for receiving part of the charge. All the chutes are fed from the same platform by the use of feed-tubes.

The reduction of zinc ores in an electric furnace is treated of by W. A. Johnson (Hartford, U.S.A.), in specification No. 27,881/12. The sulphiding of the zinc vapours is effected by first reducing the ore so that sufficient iron and copper are formed to take up all the sulphur. The treatment of other impurities is given. In specification No. 18,449, of 1912, R. W. Wallace and E. Wassmer (London) describe a process for preparing metallic magnesium which consists in treating a mixture of the chloride and sulphide in an

electrolytic bath. Friedr. Krupp A. G. (Essen) give, in specification No. 17,925, of 1913, a construction of electrode having a metallic cooled head. This fits loosely by means of a shank into the electrode, the intervening space being filled with an easily fusible metal, and the shank being able to carry the electrode even when the space is not filled up.

Maschinenbau-Astalt Humboldt (Cöln-Kalk, Germany) has described in specification No. 11,430, of 1913, how the field strength of a rotary magnetic separator may be controlled by rotatably arranging one or more of the poles in the vertical plane of the movement of the material to be separated, e.g., the pole-pieces may be moved on a concave or convex seat, and locked in any known manner. Another specification relating to separators is No. 12,368, of 1913. In this H. J. H. Nathorst, of Malmberget, Sweden, describes a construction in which a cylindrical drum rotates about a stationary system of magnets. There are an odd number of poles, and the core of each outermost pole has a lesser cross-section than the core of the nearest inside-situated pole. Both the outermost poles have the same polarity.

## MINERS' ELECTRIC SAFETY LAMPS

IN a recent lecture before the Coal Mining Institute of America, at Pittsburgh, Mr. H. H. Clark, who is the engineer in charge of the electrical investigations for the United States Bureau of Mines, said that portable electric mine lamps represented a comparatively new development in America. While actual tests had shown that glowing filaments were capable of igniting explosive gas mixtures, it had also been shown that pressures below six volts will not ordinarily ignite mine gas. As minimum quantitative requirements for a satisfactory safety lamp the Bureau of Mines offers the following specification:—Intensity of light, 0.4 c.p.; flux of light for hand lamps, 3.0 lumens, and for cap lamps, 1.5 lumens; average life of bulbs, 300 hours; average life of batteries, 3,600 hours; time of burning on one charge, twelve hours; variation in energy consumption of bulbs, 10 per cent.; angle of reflector, 100°. Six lamps were recently submitted for test, and three were accepted. These were the Ceag, Hirsch and Wico lamps. The former is now well known in this country. The Hirsch lamp is a cap lamp, and has an open-circuiting device which protects it against blows from the front. A slip of glass mounted across the bull's-eye holds in closed position an open-circuiting spring, which is released on breakage of the glass. Protection from other directions is afforded by constructing the headpiece of three concentric metal shells, the inner and outer being connected to the positive and the intermediate shell to the negative terminal of the battery. Any injury which could break the lamp bulb will jam these shells together and short-circuit the battery. The Wico lamp, which is also a cap lamp, has the bulb held in its socket by a wire stirrup against the pressure of springs, which act to eject it should the stirrup be removed or a spring broken.

**Fine under the Special Rules.**—At Airdrie on December 1st D. Reid, electrician, and J. Eadie, manager, Blairmuckhill Colliery, Harthill, pleaded guilty to failing to make a thorough examination of the electrical apparatus in the colliery, and failing to have certain cables properly covered with insulating material. The Sheriff considered that the person primarily responsible was the electrician, whom he fined £5. No penalty was imposed on the manager.

**The Association of Mining Electrical Engineers.**—A public meeting promoted by the West of Scotland Branch was held at Hamilton Town Hall on December 20th, when an address on the objects of the association was given by Mr. D. M. Mowat, and a lecture on the transmission of electrical power by Mr. A. Anderson. At the meeting on the same day of the Notts and Derby Branch, Mr. L. G. F. Routledge gave his chairman's address, emphasising the increasing responsibility of the colliery electrician, and Papers by Mr. J. Bentham on testing transformers and by Mr. J. F. Arnst on colliery equipment were discussed. At the meeting of the Yorkshire Branch, also on December 20th, Mr. H. C. Jenkins read a Paper on the choice of electrical machinery for use in mines, which provoked a lively discussion.



## WORKING EXPERIENCES ON A 1,200-VOLT D.C. LIGHT RAILWAY

A highly interesting account of the results of the first two years' working of a 1,200-volt direct-current railway in Holland was published in the *Elektrotechnische Zeitschrift* recently. This is a full-gauge line connecting Leyden with the seaside towns of Katwijk and Noordwijk, and has a route-length of 11.8 miles, of which 8.4 miles is double track.

The equipment was fully described in the *Schweizerische Elektrotechnische Zeitschrift* of Dec. 28th, 1912. There are no appreciable gradients, but owing to the numerous sharp curves and the fact that the track runs partly on the main road and partly through the streets of Leyden, the maximum speeds are limited to 25 miles per hour outside, and 12.5 miles per hour inside the towns. The rolling-stock consists of 10 two-axle motor cars, each equipped with two 80 h.p. motors, and 12 lighter cars with two 30 h.p. motors, besides a number of trailers and goods cars. The four-pole series interpole motors are controlled on the usual series-parallel system, and the series fields are provided with shunting resistances in two steps. The 80 sq. mm. copper contact wire outside the town is suspended by bronze hangers from a simple catenary of 50 sq. mm. bronze wire. No steel or iron wire was employed, owing to the proximity of the sea, but steel lattice poles are used throughout with the exception of the two mile section in Leyden, where tubular poles and span wire construction are employed. On the outside sections double porcelain insulation is adopted. The catenary wire is strung up to the porcelain insulators by flexible bronze fittings especially designed to avoid breaks of the wire at these points, and the wire is made electrically continuous by connecting loops. On the city section no catenary is employed, and the insulation consists of two hard-rubber and one porcelain insulator. The cars are fitted with bow collectors. Current is supplied from a station in Leyden direct to the contact conductor, and through two 310 sq. mm. 1,200 volt feeders to Rynsburg, some four miles out, where the line branches. The track return is assisted by two 310 sq. mm. negative feeders running half the distance to Rynsburg. Horn lightning arresters are installed every 1,000 yards.

In describing the working results in the E.T.Z., Herr H. J. Mulder points out that the equipment was designed in the year 1910, before much experience had been obtained in high-tension direct-current working, and that some troubles were to be expected. From the very first, however, the motors behaved excellently, and up to the present time, after an average service of 31,000 miles per motor-car, not one commutator has been turned or needs turning, and not one brush has yet been renewed.

The switchgear gave some trouble at first. Such 1,000-volt direct-current switchgear as was then on the market was found to be unsuitable, and an attempt to use standard H.T. oil switches ended disastrously. Any form of knife-contact on automatic switches was found to be useless, as the formation of copper beads made the action uncertain. Finally, however, the now usual form of D.C. circuit-breaker, with flat laminated copper contact faces with auxiliary copper and carbon breaks, was adopted with success.

Insulation troubles in the car switching equipments occurred at first, and it was found that only porcelain, also in some cases impregnated wood, could stand the 1,200 volts. Any hygroscopic material, including marble, which was used for the mounting of the circuit-breaker on the roof of the car, broke down after a time—due, the author considers, partly to electrolytic action and partly to the penetration of conducting particles of rust, &c., into the body of the marble. He considers, therefore, that only porcelain insulation should be employed for D.C. work over 1,000 volts. Surface conduction also takes place, and the use of ribbed insulators mounted on earthed iron frames is recommended.

The hard-rubber section insulators and other fittings have given some trouble, as a conducting path was soon formed in a crack, and even surface conduction sometimes raised the span wires in the town to high potential, the porcelain insulators between these wires and the walls or poles being alone effective. The section insulators should be longer than normal, as with a 10-inch length between a live and a dead section, a passing car taking only two or three amperes for lighting could easily draw out an arc and cause a short-circuit. Another arcing effect has been noticed in connection with the lighting. The lamps for lighting, signal lamps, and indicator-board lamps, twenty-one in all, are 20-watt Tantalum lamps connected in three circuits, seven in series in each, or 170 volts per lamp. They are all of the Edison screwed-socket pattern, and if one is unscrewed out some 10 or 12 mm., it draws out an arc in the socket and the lamps burn as before. Vibration may cause a lamp to loosen

in this way, and to prevent the slight arcing from causing fires, it is recommended that the socket should be of such a pattern that the arc inside cannot set alight the connecting wires. It is also necessary that all wiring should be in continuous metal conduit, well earthed, and that any hygroscopic material round the rubber insulation of the conductors should be stripped off near terminals so that it does not come in contact with the live metal.

Only two faults occurred in the power and lighting wiring circuits during the two years' working, and both were caused by poorly insulated leads between amperemeters and their shunts. As a testing pressure for 1,200-volt D.C. equipments, 5,000-volt A.C. is recommended; 8,000 volts A.C. was found to be insufficient. It has been noticed that when the track is copiously sanded the cars may become completely insulated, so that the whole of the metal frame is brought to contact-line pressure. To avoid this risk it is proposed to insert a minimum current relay in the pressure coils, so that on the car-wheels becoming insulated the main circuit-breaker is operated. Neither during construction nor during the two years' working has there been a single fatal accident. Cases have occurred of persons coming in contact with the 1,200-volt conductors, but only slight burns were experienced. The overhead construction in the town is of the normal tramway type with the exception of the additional porcelain insulators between the span wires and the wall-rosettes or poles, and no trouble has been experienced in spite of the high pressure of 1,200 volts except that the crack or surface creepage of the hard-rubber insulating fittings caused the span wires to be alive. For this reason, however, it is suggested that the insulation of future installations should be porcelain throughout.

## INTERNATIONAL ELECTRICAL CONGRESS, SAN FRANCISCO, 1915

THE International Electrical Congress is to be held at San Francisco, September 13th to 18th, 1915, under the auspices of the American Institute of Electrical Engineers, by authority of the International Electrotechnical Commission, and during the Panama-Pacific International Exposition. Dr. C. P. Steinmetz has accepted the Honorary Presidency of the Congress. The deliberations of the Congress will be divided among twelve sections, which will deal exclusively with electricity and electrical practice. There will probably be about 250 papers. The first membership invitations will be issued in February or March, 1914. Attention is drawn to the distinction between this Electrical Congress and the International Engineering Congress which will be held at San Francisco during the week immediately following the electrical congress. The engineering congress is supported by the Societies of Civil, Mechanical, and Marine Engineers, and by the Institutes of Mining and Electrical Engineers, as well as by prominent Pacific Coast engineers, who are actively engaged in organising it. This Congress will deal with engineering in a general sense, electrical engineering subjects being limited to one of the eleven sections which will include about twelve papers, treating more particularly applications of electricity in engineering work. The meeting of the International Electrotechnical Commission will be held during the week preceding that of the Electrical Congress.

**Electricity and Food Supply.**—Dr. C. V. Drysdale gave a lecture before the students' section of the Institution of Electrical Engineers on Nov. 26th, entitled "The Food Supply and the Electrical Engineer." He said that the principal hope for combating the exhaustion of the available stores of fertilising material lay in the production of nitrates from the atmosphere by electrical methods. The Birkeland-Eyde process of directly combining the nitrogen and oxygen of the air by an electric arc has come into operation on a large scale in Norway, and about 300,000 h.p. of water power is now utilised, fixing 35 million pounds of nitrogen annually. Another and even more largely used process is the production of calcium cyanamide or nitrolim by the Franck Caro method, a compound which splits up into lime and ammonia in the soil. About 90 million pounds of nitrogen are now annually fixed by this process, making about 125 million pounds in all. It is shown that this amount is only sufficient to increase the world's harvest of cereals by less than 1 per cent., and the needs of an unrestricted population would demand a present increase of 30 per cent., and a 4 per cent. further increase each year. There was therefore little likelihood of supply equalling demand. Suggestions were also made as to the utilisation of electrical power for ploughing and subsoil treatment for "dry farming," for increasing rainfall, electrolysis of the soil, supplying ultra-violet radiation, &c. The possibility of employing the solar energy directly for the fixation of nitrogen was also considered.



## AN IMPORTANT SPANISH WATER POWER UNDERTAKING

**A**N electric power undertaking involving the utilisation of 380,000 h.p. of water-power and the transmission of the greater part of the available energy to a city 100 miles distant is in course of development in Spain. The work is being carried out by the Riegos y Fuerza del Ebro S.A. (The Ebro Irrigation & Power Co., Ltd.), a subsidiary company to the Barcelona Traction, Light & Power Co., which has bought up or obtained a controlling interest in all the electric supply and tramway companies in and around Barcelona. The scheme includes the development of six different water powers of the river Ebro and its tributaries, and transmission of the power to Barcelona. One station, at Pobla, on the river Noguera Pallaresa, is already in operation, supplying some 1,200 kw. chiefly for constructional work at Tremp, farther down the same river, where a huge dam is under construction. This is 86 metres high and 150 meters long at the top, and when complete will cause a large area of land to be flooded, thus creating a huge storage reservoir. The water will be taken through a tunnel and a canal, and utilised in two falls, one near the dam and one some ten miles farther down the river, giving a total of nearly 100,000 h.p. A fourth station will be erected later at the junction of this river with the river Segre. At Lerida, some distance down the Segre, a 7-meter dam has been constructed, and the power station at Seros at the end of the 16-mile canal, is nearly complete. This station contains four generating units of 10,000 kw. each, with space for a fifth. The sixth development will be on the river Ebro itself, at Fayon, where some 150,000 h.p. will be available.

Power will be generated in all cases at 6,000 volts, three-phase, 50 cycles, and will be transmitted at 110,000 volts over a double-circuit transmission line on steel towers spaced on an average 220 meters apart, to a large transformer sub-station about two and a half miles outside the city of Barcelona. This substation is now being equipped for dealing with 100,000 k.v.a., and from here the power will be distributed at 25,000 volts to the manufacturing centres outside Barcelona by overhead lines, and by underground cables to a secondary distributing sub-station in Barcelona, where the current will be transformed from 25,000 volts to 6,000 volts. There is already an extensive 6,000-volt network in Barcelona with some 80,000 h.p. connected in power and lighting, and supplied from a large steam station of 50,000-kw. capacity. This load will ultimately be transferred to the hydro-electric system, and the steam plant retained as a reserve. Besides the large sub-station outside Barcelona, there is a second 110,000-volt sub-station at Igualada for the supply of the surrounding district. The company has already secured a large number of important contracts for the supply of power to textile and other factories, and the local tramways and light railways will also receive power from this system. At Lerida, a large factory for the electrical fixation of nitrogen and the manufacture of artificial fertilisers is now under construction. This will operate twenty or more arc furnaces, taking nearly 1,000 kw. each on a continuous load day and night.

Another subsidiary company of the Barcelona Traction, Light & Power Co. is the Cataluña Railway Co., which is extending the existing 600-volt light railway from Barcelona to Sarria, out to the towns of San Cugat, Tarrasa and Sabadell. The new lines now under construction have a route length of twenty-five miles, and will be operated at 1,200 volts direct-current, the cars running on the old section at 600 volts as before. Power for this railway will be obtained from two or more rotary-converter sub-stations supplied from the 25,000-volt distributing network.

**Northampton Engineering College Union Society Magazine.**—The first number of the second volume of this publication has just been sent us. In this a somewhat different plan is being pursued than was the case previously as "the element of humour is being given a more prominent position." Apart from much of the "humour," which we should imagine would not appeal to the many, there is considerable information as to the activities of the Union, as well as short interesting notes on different branches of engineering, including some remarks on rotary converters by N. E. Paine.

**Prize Competition.**—The Council of the Society of Engineers (Incorporated) may award in 1914 a premium of books or instruments to the value of £10 10s., for an approved essay on "The Status of the Engineering Profession." The Council reserve the right to withhold the premium if the essays received are not of a sufficient standard of merit. The competition is open to all, but, before entering, application for detailed particulars should be made to the Secretary, 17 Victoria Street, Westminster. The last date for receiving essays is May 30th, 1914.

## EFFECTS OF ELECTRICITY ON ANIMAL AND PLANT LIFE

**A**PAPER entitled "Physiological Effects of High-frequency Currents," by Mr. T. Thorne Baker, was read before the Royal Society of Arts on December 10th. After a brief reference to the pioneer work of Lemstrom and others, the author described results of some experiments of his own, undertaken at the suggestion of Dr. Arabella Kenealy, with a view to elucidating the causes of these effects. He noticed first of all from measurements with a sensitive capillary electrometer that the upper and lower halves of the human body are usually at different potentials, the upper part being negative and the lower part positive. Measurements were made also with growing plants, and it was found that the upper portion of the plant was negative, the roots positive. It was suggested that in some way this charge is collected from the atmosphere, and that these feeble differences of potential (of the order of a few milli-volts) are of intrinsic use in the natural processes of the plant. The effect of electrification might be due to several things; the static effect might cause a contraction in the capillary tubes, and also affect the passage of fluids through the structure by osmotic action. The facilitation of flow of liquids through capillary tubes is confirmed by the changes of blood-pressure produced by feeble oscillatory currents of high frequency. After speaking of the well-known work of Lodge and Newman, the author passed on to his own experiments with high-frequency currents. In the apparatus which he employed, each end of the secondary of an induction coil is attached to one coating of a condenser, the other coatings leading to the spark-gap, in one instance through a few turns of a large inductance or resonator. The free end of the resonator produces an "effluve" discharge, which gives the most pronounced results when the capacity and inductance product of the condensers and few turns of inductance equals the capacity and inductance product of the whole resonator. In a modification of the apparatus, stationary waves could be produced. The "effluve" discharge has remarkable effects in destroying blight in plants when used in conjunction with certain chemicals, and can be used for destroying cheese mites. By attaching a brush of fine silver hairs in an ebonite handle to the high-frequency apparatus, and brushing over the surface of the cheese with it, the surface organisms were destroyed, and a cheese, the rind of which had not actually been penetrated by the mites, could be thus rendered immune from deterioration. It is noteworthy that in this instance the intensity of the discharge and its physical character required special consideration, as it was found that by having a different type of effluve the mites were not only not killed, but were actually invigorated. A similar effect was found in investigating a fungus which attacks dried cod in the Norwegian fishing industry.

Mr. Thorne Baker then gave some particulars of the effect of radioactive earths on plants where, with a minute amount of radioactive residues, a very marked increase in the rate of growth was observed, but here again too large a proportion of radioactive material appeared to check the growth.

Returning to his experiments on the application of electrical stimulus to animal life, he said that chickens in incubators could be grown at about double the usual rate in an electric field, and at the same time the percentage mortality much diminished. In experiments at Mr. R. Meech's poultry farm at Poole, an intensive chicken-house, consisting of six flats, each large enough to accommodate seventy-five chickens, was electrified by a large helix of heavily insulated wire wound round it in turns about 6 in. apart. The current was applied for ten minutes every hour during the day. Six chickens only out of a total of 400 died, showing a mortality of only 1.5 per cent., and the chickens were ready for market despatch in five weeks as against three months.

**Air Filtration.**—At a students' meeting held at the Institution of Civil Engineers on Dec. 19th. Mr. W. E. Gurry read a Paper on air filtration and cooling and ventilating electrical machines. The chair was taken by Mr. J. S. Highfield. The author dealt with the general principles of, and the plant used for, air filtration and the cooling and ventilating of electrical generators. The Paper was illustrated by a number of lantern slides. The discussion was opened by Mr. W. Fanghaenel and continued by Messrs. P. G. Bowie and H. E. Denny. The author having replied, the Chairman, in his remarks, expressed the hope that the author would enlarge upon one of the matters lightly touched upon in his Paper, namely, the gasifying of coal and the recovery of the by-products, the use of the gas as fuel for generating steam and of the by-products for many and varied purposes.



## HALF-WATT LAMPS

THE November issue of the *A.E.G. Journal* contains an account by Dr. K. Mey of the development of the "Nitra" half-watt lamp. In addition to information concerning these nitrogen-filled lamps, already given in *ELECTRICAL ENGINEERING*, the light distribution curves of a 2,000-c.p. lamp with conical filament are included. These are given in Figs. 1 to 4, for the lamp alone; for the lamp in fitting, without external reflector, but with clear glass globe; with reflector and clear glass globe; and with reflector and opalescent globe. It has been shown by means of oscillograms that the

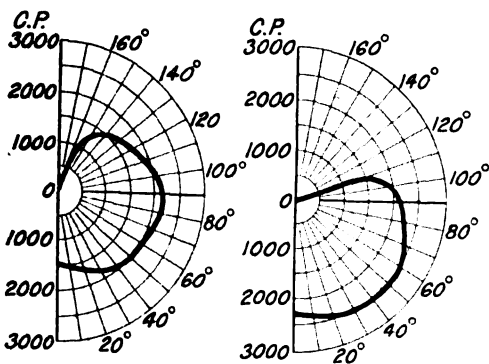


FIG. 1.—LIGHT DISTRIBUTION FROM NAKED "NITRA" LAMP.

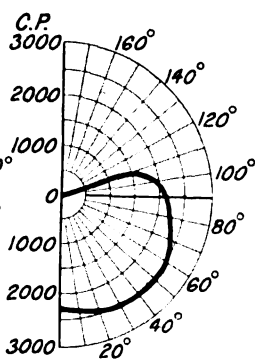


FIG. 2.—LAMP IN FITTING WITH CLEAR GLOBE.

current rush at the moment of switching on these lamps is of extremely short duration, and therefore quite harmless. The lamps are so dimensioned that they have a consumption of 0.5 watt per mean lower hemispherical candle-power. This corresponds to an average light intensity in a room of 0.65 watt per c.p. As a luminous spiral of 1 sq. mm. gives a light of approximately 10<sup>7</sup> c.p. (the spiral of a 1,000-c.p. lamp for 110 volts is about 15 cm. long and 0.64 mm. in diameter), these lamps must be used in light-dispersing globes when hung in the line of vision. An opal globe occasioning

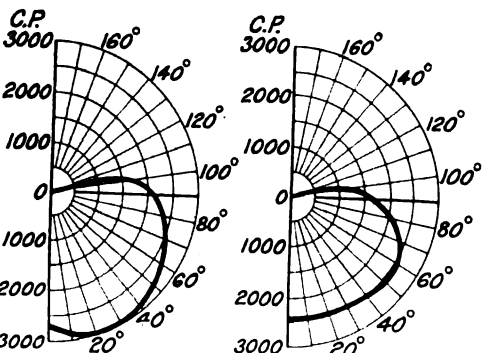


FIG. 3.—LAMP IN FITTING WITH REFLECTOR AND CLEAR GLOBE.

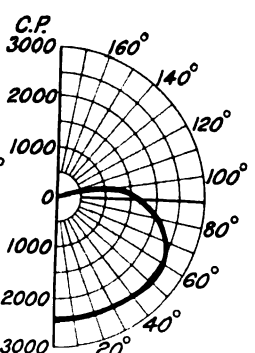


FIG. 4.—LAMP IN FITTING WITH REFLECTOR AND OPALESCENT GLOBE.

a loss of light of about 7 per cent. is recommended. Dr. Mey estimates the temperature of the filament at about 2,400° C. compared with 2,100° C. for ordinary tungsten filaments.

The new lamps are manufactured at present for candle powers from 600 to 3,000 c.p., but these figures by no means represent the limits either upwards or downwards. There is, however, very little demand for lamps with a greater light intensity than 3,000 c.p. It is probable, however, that lamps will be constructed for lower powers than 600 c.p. Suitable fittings, adapted to the special nature of the new lamp, have been constructed in accordance with the designs of Professor Behrens, and have been placed on the market simultaneously.

**Technical College Announcements.**—A series of advanced lectures on the design of generating stations, including a consideration of steam, gas and oil engines, and generators, will be given at the Battersea Polytechnic by Mr. W. H. Patchell on Mondays, January 19th and 26th, February 2nd, 9th, and 16th, at 7.30 p.m. Admission will be free, and no ticket will be required. The new course at the Crystal Palace School of Practical Engineering will commence on Wednesday, January 7th. New students should attend the previous day between 10 a.m. and 1 p.m. A prospectus will be forwarded on application to the Registrar, School of Engineering, Crystal Palace, S.E.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper, attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,372.

When slow-speed alternators of low reactance and fine regulation are coupled in parallel with high-speed turbo-generators with high reactance and coarse regulation, can the voltage of the circuit be kept constant by installing one automatic regulator? If this be possible, and as the load saturation characteristics of the two types of alternators must differ, how is the excitation point determined at which connection should be made to the regulator, in order to obtain the best results as regards constant voltage?—"X."

(Replies must be received not later than first post, Thursday, January 8th.)

### ANSWERS TO No. 1,370.

In modern turbo-generators of large capacity, what is the usual percentage of reactance? What are the advantages and disadvantages of high reactance?—A. S. T. I.

The first award is given to "D. C. W." for the following reply:—

The reactance of a large modern turbo-generator, or the voltage absorbed by the self-induction of the stator winding, is generally from 5 to 8 per cent. In other words, the inductive drop with full-load current is 5 to 8 per cent. of the generator terminal pressure. This inductive drop added in the correct phase relation to the CR drop gives the total percentage voltage drop on load exclusive of armature reaction. Another reason for expressing it as a percentage is that if divided into 100, it gives approximately the instantaneous value of the first rush of current on short circuit, as the whole of the terminal pressure must be dissipated in the armature self induction and resistance until armature reaction comes into play and reduces the generated pressure. With a view to ensuring good regulation it was customary to limit the reactance to 2 or 3 per cent. only, and as a result the current rush on short-circuit was fifty to thirty times full-load current. This caused disastrous strains on the end connections, particularly as the mechanical strains increase as the square of the current. By increasing the reactance to 6 per cent. or more, the instantaneous short-circuit current is reduced to a relatively harmless value, while the regulation may be maintained with the aid of a Tirrill or other automatic regulator. The higher reactance machine is also less expensive to build. Some engineers, however, prefer to insert external reactances in series with the machine, with the object of preventing high-frequency surges reaching the machine and building up a high voltage across the end turns of the winding. In such cases the internal reactance of the machine should not be more than 4 or 5 per cent., as the total reactance should not exceed 10 or 12 per cent. Too much reactance is detrimental to both regulation and power factor. In the case of the external reactances supplied for the 5,000-kw. 6,600-volt 25-cycle single-phase machines at Deptford for the L.B. & S.C. railway load, it has been stated that the reactances absorb less than 3.5 per cent. of the generator pressure, and that they effect less than 3 per cent. reduction in the power factor. These machines have probably a fairly high internal reactance. On the other hand, the 5,000-kw. machines at the Greenwich L.C.C. tramway station

have a reactance of from 2 to 3 per cent. only, as they have recently been fitted with 10 per cent. reactances (see *ELECTRICAL ENGINEERING*, September 11th, 1913, p. 515), increasing the total reactance to 12 or 13 per cent., and limiting the instantaneous short-circuit current to seven or eight times full-load current.

The second award (5s.) is made to "S. F.," who writes as follows:—

Turbo-generators have widely different reactances, depending on the design of machine, but a fair average is 5 to 6 per cent. The modern tendency is to increase the reactance so as to minimise the disastrous results of short circuits. Water turbos have usually double the above reactance, and slow-speed engines still higher values. The percentage reactance is given in terms of the reactive volt drop across each winding at normal current and frequency, expressed as a percentage of the "star" voltage of the machine.

The chief advantage of high reactance is to reduce the magnitude of current which would flow under faulty conditions, and the chief disadvantage is poor regulation. On sudden short circuit an alternator gives twenty to fifty times normal current initially, which drops down to about three times normal in a few seconds. The reason for this heavy current is that armature reaction takes some little time to become effective, and initially the current is limited only by the reactance of the armature (the resistance being negligible). If this was constant the initial current would equal  $V/r$ , where  $V$ =running voltage and  $r$ =reactance. The reactance, however, varies with the current owing to saturation, and decreases as the current increases, so that the initial short-circuit current would be higher than that obtained by the above formula.

Prof. Miles Walker has shown in his Paper before the I.E.E. (March 10th, 1910) the enormous magnetic forces developed on sudden short circuit, which vary as the square of the current and are very destructive to the alternator and system generally. The trouble which has been experienced in this direction has led to the increase in the value of the reactance in later machines, and also the supply of external reactances. The latter accomplish the same object as the former. Mr. E. B. Merriam, in testing a 12,000-kw. 9,000-volt, three-phase turbo-alternator belonging to the Commonwealth Edison Co. found that the initial short-circuit current was reduced to one-half by the introduction of 6 per cent. external reactance. It is obvious that the higher the reactance of a generator the poorer will be its regulation, but this is not serious in view of the general adoption of automatic voltage regulators. The advantages of "high" reactance quite outweigh its disadvantages.

"B.C." writes us as follows:—

"It is desired to internally coat a steel tank, 30 ft. by 10 ft. by 4 ft. with electrolytically deposited lead to a thickness of 1/32 in. Give the constituents of a suitable solution and the best strength of current to be used. Will the steel tank have to be specially prepared, and, if so, give a suitable solution for this."

Perhaps some of our readers can help him.

### ELECTRIC TRACTION NOTES

The Northern General Transport Co., which has been formed with a capital of £250,000 in ordinary shares, and £150,000 in 6 per cent. preference shares, has for its object the consolidation of the interests of the Gateshead & District Tramways Co., the Tynemouth & District Electric Traction Co., and the Jarrow & District Electric Traction Co.

The new company which it is proposed to incorporate for constructing a tube railway under the Tyne between North and South Shields is to have a capital of £200,000. The promoters are J. R. Hogg, W. Hutchinson, S. Hobson, J. C. Eddington and E. K. Honey. An Act for a similar railway was passed some years ago, but the time-limit for its construction was allowed to expire without anything having been done.

In its Bill before Parliament next session, the London, Brighton & South Coast Railway Co. is asking for powers to make agreements with electric supply authorities at any point on its suburban system, and also seeks to make binding upon any purchasing authority the existing contracts which the Railway Co. has in connection with the supply of electrical energy to its railways. Presumably this has reference to the possible purchase of the London Electric Supply Corporation, from whom the Railway Co. at present obtains its supply, by the London County Council.

Very considerable sums of money are proposed to be spent upon tramway and trolley omnibus schemes in the Bills which will come before Parliament next session. Two new trolley omnibus companies are to be formed, viz., the Bournemouth District Railless Traction Co., with a capital of £10,000, and the Sandbanks Railless Electric Car Co., which will also operate in the Bournemouth district. Among the interesting uses to which trolley omnibuses are proposed to be put is the conveyance of goods and passengers between the North Eastern Railway Co.'s Newcastle and Gateshead West stations, whilst the Walsall Corporation are asking powers to utilise vehicles operated on the trolley-bus system for sanitary and road-watering purposes. A feature of the tramway schemes is the number of applications for the use of trailer and coupled carriages, a policy of much interest in view of the successful use of these in London notwithstanding the very strenuous opposition of the police authorities at the time the L.C.C. applied for its powers.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

From to-day direct telephonic communication is possible between most subscribers' telephones and call offices in the City and West End of London to Basle, Geneva and Lausanne via either of the two loaded Anglo-French telephone cables and Paris. There is now a direct service between Paris and Basle and Geneva, and a service to Lausanne from Paris through Dijon. None of the land lines are loaded. As speech is only just commercially possible, it is recommended that calls be made from the "Paris" call office, G.P.O. West, Roman Bath Street, Newgate Street, E.C., which is directly connected with the trunk exchange. Descriptions of the two loaded cross-channel cables in question appeared in *ELECTRICAL ENGINEERING*, Vol. VI., pp. 179 and 807, and Vol. VIII., pp. 77 and 137.

The four-core Pupin loaded Anglo-Irish submarine cable, described in *ELECTRICAL ENGINEERING* for November 6th, 1913, p. 622, Vol. IX., is now in use. It may be remembered that the cable was made in two halves, and the first of these was laid by the Post Office cable ship *Monarch* on November 11th, from Nevin, in Carnarvonshire, and the end buoyed. The *Monarch* then returned to Woolwich and fetched the second half, which was successfully laid from Howth, near Dublin, on December 13th, when the two ends were joined together in mid-channel, as described in the previous article. The cable is also designed for phantom working, and the tests have shown that the attenuation constants of the three circuits are slightly better than those specified. There is, however, a little overhearing between the phantom and physical circuits, but this will probably be reduced when the land-lines are connected for phantom working. The physical circuits have been in use between London, Manchester, Liverpool and Ireland since December 15th, but the phantom cannot be used until the two physical circuits from these cities to the cable station are arranged on the same pole lines, so that the necessary balancing may be obtained.

At the central office of the Guernsey States Telephone Department on Dec. 20th a presentation was made to Major-General F. B. Mainguy, who is retiring after fifteen years' service as President of the Guernsey State Telephone Council. The chair was taken by Jurat J. Esten de Jersey, the new President, and Mr. R. McLean (Manager and Engineer), in a long speech, outlined the history of the Guernsey telephone undertaking, which, largely owing to the initiative of Gen. Mainguy, had been maintained independently of either the Post Office or the National Telephone Co. for the last fifteen years, and now numbered 2,110 circuits, or one to every twenty inhabitants, having thus the best telephoned area in the United Kingdom. The gift, which we illustrate here, was an imitation of a hand-combination telephone set, made by J. McMillan & Co. (Clun House, Surrey St., Strand), containing a clock, an aneroid, and a thermometer, made by Negratti & Zambra.



We learn that the Baudot system of multiplex telegraphy

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published December 24th, 1913

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

27,747/12. **Illumination of Studios, &c.** A. C. and M. A. ADAMS. Illumination for photographic or painting purposes is obtained by arc lamps arranged behind a composite filter screen of white and tinted layers of open net-like fabric. It is arranged that some light passes direct, while some is reflected from parts of the screen. This is sinuously arranged. Four figures.

28,046/12. **Ovens and Grills.** A. F. BERRY. A heating element is in contact with a doubly inclined and fluted metal plate, on which the viand to be cooked is placed, while above this is a second element and a movable arm having a universal joint, so that searing may be rapidly effected by moving the element laterally or by tilting. Four figures.

28,108/12. **Rotary Converters.** PHOENIX DYNAMO MFG. CO. and R. POHL. The pressure on the D.C. side is adjustable by the use of a booster, which is also used as a starting motor. The booster is arranged on the shaft of the rotary, and has a laminated field structure without salient poles, the windings of which serve not only as exciting windings, but as secondary windings during starting, so as to increase the torque. This winding is of the two- or three-phase type, and is connected to a regulating resistance through suitable switches so as to perform either of the functions mentioned. Three figures.

29,750/12. **Heating Element.** H. J. DOWSING and D. HUNTLEY. Filaments of quartz are formed into bundles, and over the exterior surface is wound the resistor. To facilitate the formation of the quartz filaments into bundles of the required shape, a gum or other binding material, which may afterwards be burnt off, dissolved, or removed in some other way, is used. A number of the quartz bundles may be arranged side by side, and the resistor wound or woven alternately over and under, so that a single mat-like element of a flexible nature, which is a good conductor of heat and diathermal results. As the quartz bundles are not liable to fracture they may be used to give continuous contact between the electrical element and any flat or curved surface, e.g., a hot plate. Seven figures.

2,009/13. **Measuring Capacity in Telephone Circuits.** G. A. CAMPBELL, O. B. BLACKWELL, and E. H. COLPITTS (Western Elec. Co.). To measure capacity unbalances in a telephonic phantom circuit, a testing set, consisting of a variable capacity and means for connecting it in different combinations between an element of one of the pairs of elements of the phantom circuit, and both elements of another of the pairs, and means for determining when the variation in the connected capacity has equalised the capacity between the elements, as well as means for indicating the amount of the equalising capacity, is used. Five figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** JOHNSON (*F.I.A.T. Fabbrica Italiana Automobili Torino and Soc. Anon. Officine Galileo*) [Portable light-projecting apparatus] 14,710/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** WAKEHAM [Casing: especially for ships' panning, partitions, &c.] 25,539/12; SOC. INTERNATIONALE DE LUMIERE FROIDE (PROCÉDÉS DUSSAUD) [Lighting system] 28,229/12; LODGE and LODGE [H.P. insulators] 29,269/12; FRIEDR. KRUPP A.-G. (GRUSONWERK) [Machines for taping cables] 9,575/13; HUME [Machine for manufacturing conduits, &c.] 21,626/13.

**Dynamos, Motors and Transformers:** HEYLAND [Diminishing the electromotive forces induced in the commutation zone of commutator machines] 29,409/12, CROMPTON & CO. and BURGE [Polyphase synchronous motors] 15,523/13; ASHDOWN and ROBINSON [Interchangeable A.C.-D.C. motor] 19,395/13.

**Heating and Cooking:** MC. COURT and RADIANT HEATING [Heating of fluids] 22,305/12; HULBERT [Controlling heating apparatus] 28,409/12.

**Ignition:** RUSHMORE [Starting motors] 29,932/12; FREIBERG and PETZSCHE [Sparking plugs] 20,361/13.

**Incandescent Lamps:** SKAUPY [Vacuum lighting tubes] 29,104/12 and 14,591/13; VEREINIGTE GLANZSTOFF-FABRIKEN A.-G. and BRONNERT [Manufacture of filaments from copper cellulose solution] 4,922/13; DEUTSCHE GASGLÜHLICHT A.-G. (AUERGES) [Production of bulbs with reflectors] 15,360/13; WOLFRAM-LAMPEN A.-G., 15,824/13.

**Instruments and Meters:** B.T.-H. Co. and YOUNG [Mercury motor meters] 1,600/13; CHILDS and REASON MFG. CO. [Electrolytic meters] 14,310/13.

**Switchgear, Fuses and Fittings:** LEVEQUE-PETIT [Switches] 9,179/13.

**Telephony and Telegraphy:** MARCONI [Wireless telegraph transmitters] 28,865/12; CLAUSSEN [Sound-reproducing apparatus] 3,534/13; MOLL and KUSCHEWITZ [Protection for telephone and telegraph wires against inductive action] 11,208/13; LYONS [Selective telegraph receivers] 15,097/13.

**Traction:** SOC. S.T.A.R. (SYSTÈME DE TRACTION AUTO-RÉGULATEUR) [Electric machines] 27,923/12; ROBINSON [Automatic speed regulation] 28,327/12; SANDBERG and HASENOHRL [Preventing collision of trains] 11,839/13; EVANS and J. B. SAUNDERS & CO. [Railway electric signals] 20,318/13.

**Miscellaneous:** WEINTRAUB and RUSH [Refractory materials] 20,348/12; NOURNEY [Luminous advertisements] 28,350/12; NICHOLLS [Illuminated signs] 29,995/12; FRANCHIMONT and YSEBOODT [Remote controlled signalling apparatus] 30,092/12; WOLF [Miners' safety lamps] 6,408/13; KEEN [Combined moving target and automatic indicator] 8,603/13; SANDBERG [Automatic clock winding] 11,512/13; YARROW [Synchronising arrangements for facilitating the coupling of rotating shafts] 13,080/13; GREEN [Vacuum tubes] 14,940/13; YAI [Primary battery] 15,909/13; MALONE [Thermostatic control of ventilators] 17,621/13; CLAUDE [Illuminating and advertising devices] 19,439/13; RABBIDGE [Absorbents for dry batteries] 19,783/13.

The following Specifications are open to Inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** SIEMENS-SCHUCKERT [Relay arrangements for the automatic control of circuits] 27,824/13.

**Electrometallurgy and Electrochemistry:** CLEMM [Electrolysis of alkali chlorides] 21,462/13; HIORTH [Induction furnaces] 22,159/13; RENNERFELT [Furnaces] 24,850/13.

**Heating:** DE KOK [Water heaters] 16,214/13

**Ignition:** UNIONWERK MEA GES. [Contact breakers for magnetos] 23,739/13.

**Telephony:** SIEMENS & HALSKE [Circuits] 27,646/13.

**Traction:** LAUTENBACHER [Tightening and separating trolley wire sections] 25,951/13.

**Miscellaneous:** DE MELLO [Batteries] 24,471/13; LINDEMANN [Regulating the gas pressure in Röntgen and vacuum tubes, &c.] 27,599/13.

### Opposition Entered to Grant of Patent

22,548/12. **Drawn Tungsten Filaments.** POPE'S ELEC. LAMP CO. (*C. Trenzen, Germany*). Opposition to the grant of this patent (ELECTRICAL ENGINEERING, Nov. 6th, p. 620, Vol. IX.) has been entered.

### Grant of Patent Allowed

19,014/12. **Selective Wireless.** F. JAMIESON. The Comptroller has allowed the grant of this patent in spite of opposition (ELECTRICAL ENGINEERING, May 8th, 1913, p. 264, and July 3rd, 1913, p. 398, Vol. IX.).

### Appeal from Comptroller's Decision

3,878/12. **Shaft Rotation Indicators.** P. R. KEEPIE and H. M. R. MADDICK. The Comptroller's decision to allow the grant of this patent in spite of opposition is appealed against.

### Expiring Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SIEMENS DYNAMO WORKS (*Siemens-Schuckert*) [Regulation of alternators running in parallel] 18,715/08.

**Instruments and Meters:** W. POWLES and E. E. MOORE [Single needle galvanometers] 20,399/06; H. B. BISHOP [Testing liquid conductivity] 19,048/08.

**Switchgear, Fuses and Fittings:** E. GARSIDE [Motor controllers] 18,965/08.

**Miscellaneous:** A. H. SCHERZER [Bascule bridges of the rolling-lift type] 20,022/07, 20,023/07, and 20,024/07.

is about to be put in commission between London and Liverpool and Glasgow. Quadruple Baudot has been worked for some time between London and Birmingham, and sextuple working is now going to be introduced. This will enable six messages to be sent simultaneously in each direction, and means an interchange of about 860 words per minute.

The Zanzibar-Mombasa cable has been restored, and the Persian lines between Borazjoon and Ahvaz were down on the 14th inst. On this day, also, the French Company announced the opening of their office at Puerto Rico, at the same rates as are in existence via Key West. This will naturally mean the loss of traffic to the West India and Panama Telegraph Co.—The Chio-Tenedos cable failed on the 15th inst., and on the 16th the French Co. had another

patient in the Paramaribo-Cayenne cable.—The French Co. are now taking traffic from S. Domingo City, La Romana and San Pedro de Macoris by wireless to Ponce, and forwarding it thence by cable.—The Sitka-Valdez cable was repaired on the 18th inst., and broke again on the 19th.—The El Arich route was down on the same day between Beyreuth and Gaza, and was restored on the 19th inst.—The Chio-Tenedos cable was working again on the 21st inst.—The Jamaica-Colon cable is still apparently interrupted.—The lines of the Indo-European Telegraph Co. were down between Tiflis and Soukhoun-Kale from the 23rd to 25th inst., and on the latter date the Sitka-Valdez cable was restored.—On the 26th inst. the Tenedos-Chio and Tenedos-Lemnos cables failed.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 13. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**IMMINGHAM DOCKS.**—We have received from the Great Central Railway Company a copy of the Immingham Tide Table for 1914. This neat booklet, which has been produced in pocket size, gives the high-water and low-water tides at Immingham for each day of the year, in addition to useful facts and figures, charges, steamship services, &c., respecting the ports of Immingham and Grimsby. Copies of the Tide Table will be sent free on application to Great Central Publicity Office, 216 Marylebone Road, London, N.W.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**DIRECT-CURRENT GENERATORS.**—A leaflet has just been issued by T. W. Broadbent, Ltd. (Victoria Electrical Works, Huddersfield), dealing with D.C. generators of sizes ranging from 100 to 500 kw. for direct coupling. The machines are listed for medium speeds, 214 to 250 r.p.m., and for high speeds, 525 to 300 r.p.m. They are guaranteed to work at the specified output continuously and for a period of one hour with an overload of 25 per cent. without injurious heating or sparking. Details of the construction and materials used are given. The company intimates its willingness to post a copy to any of our readers who care to apply for one.

### CHRISTMAS SOUVENIRS, &c.

WE have been favoured by Venner & Co. with one of the very neat little silver toothpicks which they are presenting to their friends. We are asked to state that they have sent these out to all their usual friends, and have practically exhausted the stock, but if any of the usual recipients have not received one, the firm will be glad if they will let them know. Some extremely humorous instructions accompany the apparatus.

A nickelled two-bladed pocket-knife comes with the greetings of the Sun Electrical Co., who state that if any of their customers and friends have not received one, the post office must be blamed. They add that since issuing these knives they have found that certain of their customers hold superstitious beliefs regarding the acceptance of knives, and have accordingly presented them in exchange with a small coin. Should any applicant prefer to be on the safe side and act likewise, they shall be very pleased to see that the funds of the Electrical Trades Benevolent Institution are duly credited with the amounts.

An attractive pocket diary in a substantial case of grey leather has been sent us from Switchgear & Cowans, Ltd. The diary is in convenient form, containing much useful information and a few selected prices of standard items of the firm's manufacture are given under the front cover. The firm have a limited number still to dispose of, and our readers are invited to apply for them.

A very striking design of daily tear-off office calendar is being sent out by Pope's Electric Lamp Co.

The Electric Construction Co., Ltd., accompany their good wishes this season by a very neat calendar and diary in a leather case of suitable size for the waistcoat pocket.

The well-known real red heat show-card design, with a girl,

a cat, and a piece of toast warming themselves by a Bastian electric radiator, is reproduced on a calendar which we have received with the compliments of Mr. C. O. Bastian.

The Electric Supply Publicity Committee have issued an attractive calendar illustrating some of the uses of electricity for the use of supply companies and local authorities.

We have received a particularly clearly printed monthly tear-off Calendar from the Victa Electrical Co., of Battersea.

Alfred Graham & Co. have sent us a copy of a neat little pocket-book of speed and tide tables for 1914 for the principal seaports in the United Kingdom, containing also a good deal of nautical, electrical, and engineering information.

### THE LIGHTING OF A LONDON PRINTING WORKS

ON several occasions the lighting of printing works has been discussed in our columns; recently the printing works of the Boots Pure Drug Co., Ltd., were cited as an example of up-to-date methods in the illumination of such places, carried out by the British Thomson-Houston Co., Ltd. (77 Upper Thames Street, E.C.). The Company have lately carried out an installation on similar lines at the works of Messrs. Gee & Co., printers and publishers, of Phipps Lane,

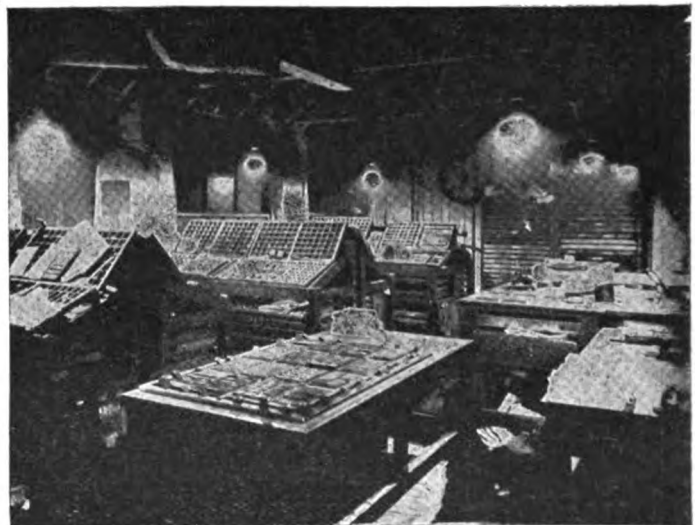


FIG. 1.—COMPOSING ROOM.

E.C. Local lighting is employed in the machine room, the installation consisting of a single 60-watt Mazda lamp and Mazdalux reflector suspended 9 ft. from the ground over each of the seven machines. In one composing room ten units, 8 ft. from the floor, each consisting of a 60-watt Mazda lamp and Mazdalux reflector, provide good general illumination throughout the room, and are so arranged as to give a much stronger local illumination on the composing desks and tables. Another small composing room is lighted by thirteen 40-watt Mazda lamps and Mazdalux reflectors, fixed 2 ft. above the top of the composing desks. Ten 80-watt and seven 40-watt Mazda lamps, equipped with Mazdalux reflectors, are used

## What the Public Wants.

### CONSUMERS' BOOKLETS

ON

### THE USES OF ELECTRICITY

describing in simple language the various applications of electricity.

Many thousands of these booklets have been sent to consumers and prospective consumers by electricity works and wiring contractors.

**Part I. ELECTRIC LIGHTING** (including the lighting of Private Houses, Tradesmen's Shops, Shop Front Lighting, Electric Signs, &c.). Price **One Penny** (By post, 2d.); 7s. 6d. per 100 (By post, 8s.); £3 3s. per 1,000 (Carriage forward).

**Part II. ELECTRIC COOKING AND HEATING, and other Domestic Uses of Electricity** (Electric Irons, Electric Fans, Vacuum Cleaners, &c.). Price **Two Pence** (By post, 3d.); 11s. 6d. per 100 (By post, 12s.); £5 5s. per 1,000 (Carriage forward).

**Part III. WORKS DRIVING** Price **Two Pence** (By post, 3d.); 11s. 6d. per 100 (By post, 12s.); £5 5s. per 1,000 (Carriage forward).

THE KILOWATT PUBLISHING CO., LTD.

TEMPLE CHAMBERS, LONDON, E.C.

in the folding and binding rooms respectively. The various offices, warehouses, stores, &c., are lighted throughout by Mazda lamps, equipped in some cases with prismatic glass reflectors, and in others with enamelled iron shades. The installation is a good example of modern industrial lighting, in which adequate illumination is given at all necessary points, while at the same time glare is avoided by the use of properly designed reflectors to hood the lamps. In conclusion, it should

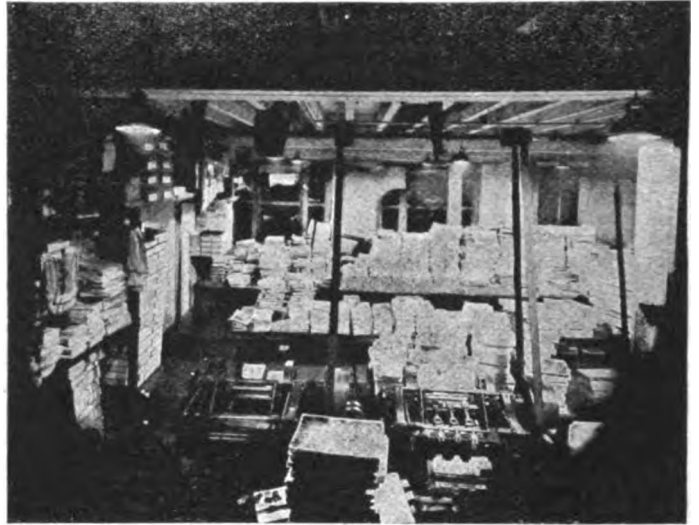
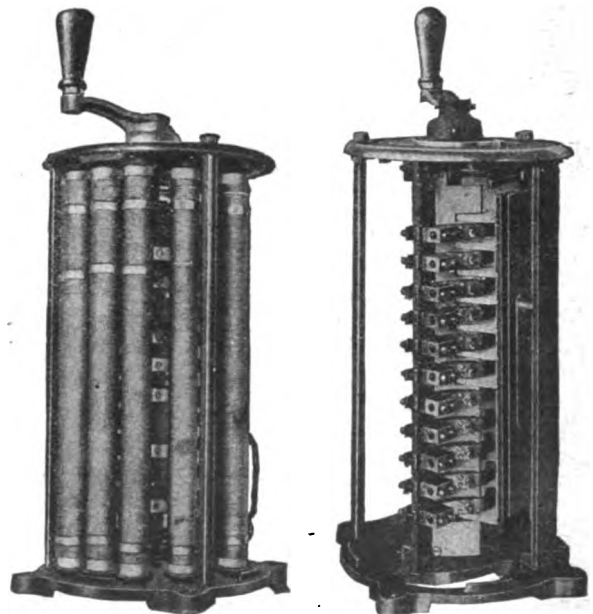


FIG. 2.—FOLDING ROOM.

be stated that the experience and services of the British Thomson-Houston Co.'s illuminating engineers are freely at the disposal of anyone interested in the lighting of printing works.

### A NEW MOTOR CONTROLLER

FOR the purpose of controlling small cranes and for installing in situations where space is at a premium, the General Electric Co., Ltd. (of Witton, and 67 Queen Victoria Street, E.C., &c.), have designed a form of controller in which the resistances are contained inside the controller case itself. In general, it may be said that this controller is a miniature edition of the larger sizes of G.E.C. controller, with the exception that it inherently includes the resistances. As will be seen from the accompanying illustrations, the controller is circular in plan view, and the resistances are fixed inside



With resistances.

Without resistances.

NEW DESIGNS OF G.E.C. CONTROLLERS.

the controller casing well away from the arcing parts. They are carried on insulating tubes threaded on vertical steel conduits which are insulated from the case by means of porcelain insulators. If desired, the resistances can be



supplied separately, in which case they are mounted in a separate protected frame, which can be placed any distance away from the controller. The design of the controller, however, is such that the inclusion of the resistances inside the controller is thoroughly satisfactory.

## THE ELECTRICAL ENGINEERS' DIARY

THE high standard of the "Electrical Engineers' Diary," published by Messrs. S. Davis & Co., 30 and 31 St. Swinham's Lane, E.C., is well maintained in the 1914 edition, a copy of which is just to hand. It contains much valuable technical information on the generation and application of electrical energy in all branches, and there are also, as usual, the very useful list of London streets in which mains are laid, and the list of electrical supply authorities in the United Kingdom. Approximate figures are given of the numbers of electricity and gas consumers, and the moral is pointed that an extensive advertising campaign is needed in the electrical industry to bring home to the public the extraordinary advantages, conveniences and economies of electricity. In individual districts, of course, this policy is already being carried out, but for the general good of the industry that co-operative effort of which so much is heard from time to time would be a profitable one to all concerned.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Basingstoke.**—A Local Government Board inquiry has been held concerning a loan of £14,000 in connection with the Council's electric lighting scheme.

**Dundee.**—One 5,000-kw. turbo-alternator; condensing plant; one 750-kw. rotary-converter with transformer. (See advt.)

**Haslingden.**—A loan of £700 has been sanctioned for sub-station plant.

**Manchester.**—Water-coolers for Stuart Street generating station. Chief Electrical Engineer. January 16th. (See advertisement on another page.)

**Mansfield.**—The Electrical Engineer has been instructed to report with regard to an extension of the generating plant.

**Rathmines.**—A Local Government Board inquiry has been held regarding a loan of £12,160 for electricity works extensions.

**Southampton: Meters, &c.**—Borough Electrical Engineer, January 12th. (See advertisement on another page.)

**Stoke-on-Trent.**—The Engineer has been instructed to report as to the total cost of mains, posts, and lamps for street lighting by means of flame arc lamps in the Stoke area.

**Swansea.**—One or two years' supply of motors and starting switches is required. Borough Electrical Engineer.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Camborne.**—New school.

**Doncaster.**—Cinematograph theatre in High Street. Architect, E. H. Walker.

**East Ham.**—New school in Dersingham Avenue.

**Glasgow.**—Electric lighting at police buildings in Albert Street, Govan. Town Clerk.

**London.**—318 lights at Vernon Square school, Finsbury, and 258 lights at Ranelagh Road school, Pimlico. (See advertisement on another page.)

**Manchester.**—120 working men's houses.

**Mansfield.**—Cinematograph theatre, Skerry Hill.

**Mexborough.**—New baths.

**Mossley.**—New baths.

**Northallerton.**—Cinematograph theatre.

**St. Albans.**—Electric lighting of infirmary. Clerk to Guardians, Chequer Street.

**Salford.**—Tuberculosis sanatorium. Town Clerk.

**Southend.**—131 houses; also a cinematograph theatre in Leigh.

**Southport.**—Rebuilding of municipal offices (£6,000).

**Warrington.**—New school.

**Watford.**—Additions to infirmary.

## Miscellaneous

**Australia.**—Copies of specifications for a large number of materials, including cable and electric clocks, for the Australian Postmaster-General's Department, may be seen at 73 Basinghall Street, E.C.

**Birmingham.**—Twelve months' supply of electrical sundries for the Tramways Department. General Manager. January 26th.

**Haslingden.**—A loan of £700 for overhead tramway equipment has been sanctioned.

**Nelson.**—After considering the merits of motor-buses and trolley-buses, the Tramways Committee strongly favours the latter, and a scheme will be placed before the Council at an early date.

## APPOINTMENTS AND PERSONAL NOTES

A recommendation of the Dundalk Electricity Committee to appoint Mr. J. M'Entee, of Belfast, Assistant Electrical Engineer, at a salary of £100 a year, brought forth some somewhat startling comments from one of the councillors. This gentleman, Councillor J. M. Johnson, objected to the appointment, and added that although the present Borough Electrical Engineer to the Council was being paid £250 a year, a fully qualified man could be obtained for £100 per annum. Fortunately, however, he was not allowed to have his own way, and the appointment of the Assistant Engineer was agreed to.

On the 20th inst., Mr. J. W. Beauchamp, Engineer and Manager of the West Ham Corporation Electric Supply, presented Mr. W. T. Hellaby, late Superintendent of the Representatives' Department, with a handsome marble clock on behalf of the staff and employees, on the occasion of his leaving to take up an appointment as Assistant Sales Manager for the Sunderland Electricity Undertaking, and in the evening a farewell dinner was given to Mr. Hellaby at Frascati's Restaurant, presided over by Mr. F. Farndon, Sales Manager of the West Ham Corporation Electricity Undertaking.

The estate of the late Sir William Preece, K.C.B., F.R.S., has been valued at £32,320.

The Dawlish U.D.C. requires an official for testing the illuminating power, from time to time, of the public electric lamps. Applications to the Town Clerk by January 6th, stating terms.

A sub-station charge engineer is required by the Bristol Corporation Electricity Department. (See advertisement on another page.)

**Gas Companies and Electricity Supply.**—Quite a number of gas companies are applying to Parliament next session for powers to supply electrical energy within their districts. Among them may be mentioned the gas companies of Deal and Walmer, Stone, Lurgan, Leyland, Hightown, Brentford, and a combined scheme for Blackrock, Kingstown and Dalkey by the Alliance & Dublin Gas Co. In connection with the latter there was a hard fight last session between the gas company and a local electricity company which was granted a Lighting Order for Kingstown. This, however, was subsequently withdrawn by the Government, much to the dissatisfaction of the promoters. The reason for the withdrawal of this particular Order was, we believe, in order to save the large number of other Orders contained in the same Confirmation Bill, which would have been jeopardised had the opposition to the Kingstown Order been persisted in at the third reading stage.

**Water Softening Plant.**—An impending amalgamation is announced between the well-known firms of water-softening plant manufacturers of Lassen & Hjort, Ltd., and Water Softeners, Ltd., who will henceforth carry on business under the title of United Water Softeners, Ltd. Lassen & Hjort are the patentees of a lime and soda system, while Water Softeners, Ltd., recently introduced the "Permutit" regenerative system. By means of combinations of the two systems a much greater range of conditions can be met than could be with either singly. The management of the new company will be in the same hands as was that of the original concerns, and pending the acquisition of larger offices, the business will be carried on at the existing offices of the two concerns jointly.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

## SERIOUS SUPPLY INTERRUPTION AT EASTBOURNE

ON Monday last week a serious interruption to the supply of electricity in Eastbourne occurred. A fault developed in the high-tension cable supplying an outlying district, which blew the fuses in a cast-iron section pillar. When these fuses were replaced, practically the whole of the switchboard in the pillar was blown to pieces, and a very bad short was caused on two large feeders. One of these broke down absolutely and burnt the other, which was lying close to it. This was followed by the blowing of all the high-tension and low-tension fuses of the other feeders in the neighbourhood which were coupled to the network, so that, in addition to the two circuits in question, the lights were out in the business portion of the town until the faulty feeders could be isolated and the fuses replaced on the unaffected cables. The interruption to the supply lasted several hours, and caused a great deal of inconvenience and indignation in the town, especially as there had been an interruption, of less serious nature, however, on the preceding Saturday. Mr. J. K. Brydges, the Borough Electrical Engineer, has, unfortunately, been away from duty for some time owing to serious blood poisoning in the left hand, but we are informed that the Assistant Electrical Engineer, Mr. Herbert Bowlan, who was in charge, did all in his power to cut out the faults and restore supply as quickly as possible.

## LOCAL NOTES

**Chiswick: Purchase of Electricity Undertaking.**—There has been a good deal of opposition and discussion in the Council with regard to the bill deposited for next session, dealing with the purchase of the local electric supply company, and the advocates of the purchase in order to pin the Council down to a definite line of action, have been successful in getting passed a resolution to the effect that the Council will itself work the undertaking, and will not lease it after purchase.

**Dublin: Street Lighting.**—The City Electrical Engineer, after a little difficulty, induced two firms, viz., the General Electric Co. and Johnson & Phillips, to give a free trial of a full circuit of arc lamps for street-lighting purposes, numbering twenty-two. This trial was started early in 1913, and Mr. Mark Ruddle now recommends that the lamps should be taken over from both firms. Further trials with arc lamps have been postponed pending the availability of the new half-watt metal-filament lamps.

**Harwich: Electric Lighting.**—Acting under advice from Mr. Haydn T. Harrison, the Council has decided to promote an electric lighting provisional order.

**Hinckley: Electric Lighting.**—As previously announced in these columns, the Urban District Council has agreed with the Midland Electric Light & Power Co. with regard to an electric lighting order, but the Rural District Council has decided to oppose before the Board of Trade.

**Horsham: Electricity Works Pupilage.**—The Council is offering a pupilage at the electricity works free of premium for three years to sons of ratepayers resident in the district since January 1st, 1912. The age-limit has been fixed between 14½ to 17 years.

**Lurgan: Electric Lighting.**—The proposed municipal electric lighting scheme is arousing a good deal of interest, and a deputation has waited upon the Council urging, in preference, the purchase of the local gas company.

**Stafford: New Tariff.**—The Council has decided to allow consumers using lamps for external lighting at 3d. per unit to use an equal quantity of current for lamps for internal lighting at the same charge. When the quantity used inside the premises exceeds that used for external lighting, the ordinary tariff of 5d. will apply. This arrangement only applies to consumers using not less than 1,000 units per quarter for external lighting.

**West Bridgford: Electric Supply.**—After succeeding in getting the Derbyshire and Notts Power Co. to cut this district out of their Parliamentary Bill, the Council has after all decided not to proceed with its application for an electric lighting provisional order.

**Electric Lighting Provisional Order Applications.**—Fifty-one applications have been made to the Board of Trade for electric lighting provisional orders.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £68 5s. to £68 15s. (Last week, £66 5s. to £66 15s.)

**Branch Office.**—George Ellison (Warstone Lane, Birmingham) has opened a branch office at 4 Cannon Street, Manchester, to deal with the Lancashire and Yorkshire business, under the management of Mr. W. A. Kirkham. It is requested that clients in these two counties will forward their inquiries to the branch office.

**Bankruptcies.**—The public examination of Charles Blake, trading as the Bilston Electrical Co., 4 Church Street, Bilston, will take place at the County Court, Wolverhampton, on January 21st, at 2.30 p.m.

**Partnership.**—Mr. H. G. W. Haslett, who has been connected with the electrical trade for the last fifteen years, a considerable portion of the time being with Messrs. Krupka & Jacoby, Ltd., informs us that he has entered into partnership with the well-established business of Messrs. Ralph H. Haylock & Son, Mechanical and Electrical Engineers, 63 Queen Victoria Street, E.C.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**A.E.G.**—The past financial year has been attended by the most successful results of any within the 30 years' history of the company, particularly as regards the turnover and orders received. After deducting debenture interest, there is a net profit of 28,904,483 marks, and after payment of a 14 per cent. dividend, 1,000,000 marks have been set aside for the reserve fund, 15,000,000 marks for armament tax, 1,000,000 marks has been written off new buildings, 1,200,000 marks distributed as bonuses to employees, and 1,000,000 paid into the benevolent fund. The company is erecting a power station in the Bitterfeld coal district, which is intended to serve as a model for very large generating plants. The idea is to utilise this station for the supply of electrical energy at exceptionally cheap rates to Greater Berlin. The company's operations are particularly active in the Russian Empire.

**Holophane.**—At the annual meeting on Tuesday, it was reported that although the Company's business has shown a substantial increase during the past year, the net sales amounting to 50 per cent. over those of the previous year, the Company has suffered considerably from the effects of litigation both in this country and America following disputes concerning contracts. Serious efforts are being made to reduce manufacturing costs owing to competition from new lines of cheaper white glassware now coming on the market, and in this connection land has been purchased near Paris for the erection of a new factory. A dividend at the rate of 7 per cent. on the preference shares is to be paid, clearing off the preference dividend up to June 30th last.

**The Electrical Engineers' Ball, 1914.**—Notwithstanding the increase of engagements which make their appeal to the members of the electrical profession and industry, the Electrical Engineers' Ball, which is to be held at the Hotel Cecil on Friday, February 20th, is likely to be as great a success as usual. The following are the members of the Committee:—H. Alabaster, A. Bruce Anderson, F. Bailey, O. H. Baldwin, R. Belfield, H. H. Berry, W. W. Blunt, J. H. Bowden, D. A. Brown, Leonard Byng, T. O. Callender, C. S. Colton, F. R. Davenport, Sydney Dobson, T. C. Elder, S. Z. de Ferranti, E. J. Fox, E. Garcke, T. E. Gatehouse, K. Geipel, Wm. Geipel, Jas. Gray, R. Kaye Gray, A. E. Hadley, F. B. O. Hawes, Charles Hill, J. S. Highfield, H. Hirst, Col. H. Capel Holden, J. P. Hooper, C. E. Hunter, J. E. Kingsbury, H. M. Leaf, W. S. Lonsdale, H. T. S. MacKay, W. L. Madgen, W. Lee Matthews, W. M. Mordey, P. V. McMahon, Lee Murray, F. H. Nalder, E. A. Nash, Major O'Meara, Hugh A. Pearson, M. J. Railing, Martin F. Roberts, Leonard L. Robinson, J. H. Rosenthal, P. F. Rowell, W. Rutherford, Sydney Sharp, J. Shepherd, Alex. Siemens, A. M. Sillar, H. Scholey, Frederic Smith, C. P. Sparks, J. J. Steinitz, G. Sutton, C. D. Taite, J. Taylor, Godfrey M. C. Taylor, R. J. Wallis-Jones, F. W. Willcox, Prof. E. Wilson, F.R.S., C. H. Wordingham. The Executive Committee is composed of O. H. Baldwin, E. J. Fox, W. L. Madgen, P. V. McMahon, J. Shepherd, R. J. Wallis-Jones, and C. H. Wordingham. Messrs. H. Alabaster and A. M. Sillar are the Hon. Secretaries, and the Hon. Treasurer is Mr. J. E. Kingsbury.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 367 [VOL. X., No. 2]  
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THURSDAY, JANUARY 8, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 308-309, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Owring, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

NEGOTIATIONS having been broken off between the London Electrical Masters' Association and the Electrical Trades Union, an effort is now being made to deal with the conditions of wiremen's employment independently of the Union. (Page 16.)

ELECTRICITY is used even more extensively than usual in this year's Drury Lane pantomime. (Page 17.)

We give the terms of the clause proposed by the North Metropolitan Electric Power Supply Co. for prohibiting strikes of its employees. (Page 18.)

TESTS on a 100-kw. mercury-vapour rectifier delivering direct current at 350 volts from a three-phase 50-cycle supply are described. The efficiency is over 90 per cent. A steel construction is adopted, and outputs up to 1,200 kw. have been reached by this means. (Page 19.)

A DESCRIPTION of the machine known as the phase-balancer is given. This consists of a synchronous condenser with a series booster. (Page 19.)

We refer to a number of applications to Parliament by Corporations asking powers to hire out motors, &c., leaving the contractors the work of fitting up consumers' premises. (Page 19.)

SOME particulars of a storage battery in use with counter e.m.f. cells in America are given. (Page 20.)

AN appeal has been lodged against the Comptroller's refusal to grant patents on three applications by the Julius Pintsch A.-G. The patents relate to ductile filaments of tungsten alloys. (Page 20.)

A CURIOUS fault on a crane circuit is discussed in our Questions and Answers columns. (Page 20.)

AN important conference was held at the Mansion House on Monday in order to secure the co-operation of employers in the new scheme of evening instruction inaugurated by the L.C.C. (Page 21.)

THERE was published by the Patent Office last week a specification by G. Marconi for rotary disc dischargers used in a tuned circuit coupled to the antenna through an intermediate tuned circuit. Another patent relates to starting up polyphase synchronous motors. This is by Crompton and Co. and H. Burge. (Page 23.)

THE Earl's Court-Willesden section of the London and North-Western Railway will soon be running electrically, and progress is being made with the conversion of the other lines and with the Stonebridge Park generating station.—The Lancashire and Yorkshire Railway Co. has decided to convert its line from Manchester to Bury to electric traction.—The Dolter surface contact system on the Hastings sea front has been condemned by the Board of Trade.—An important scheme for running tramways under the River Mersey has been prepared by the Liverpool Tramway Manager. (Page 24.)

THE Hull Corporation has now decided to purchase the Post Office telephone system in that town.—The trawlers using the Port of Hull are to be equipped with wireless.—Some particulars of the aerial tower at the Goldschmidt wireless station at Tuckerton are given. (Page 24.)

SOME crystal glass fittings are illustrated, and a new ignition battery, an electric grinder and some new automobile lighting switchboards are described. (Pages 25 and 26.)

EXPENDITURE upon new plant, mains, services, &c., is contemplated as follows:—Belfast (£15,000); Rotherham (£15,956); Rhyl and York.—Generating plant, rotary converters, &c., are required at Ipswich; a 5,000 kw. turbo-generator at Bradford; and Diesel engine-driven sets in New Zealand.—New tramcars are required at Accrington; miscellaneous stores at Plymouth; rotary converters by the N.S.W. Railways Department, and a considerable expenditure upon tramway extensions at South Shields is being provided for. (Page 27.)

THE Hove Corporation has agreed to a price for the purchase of the local electric lighting undertaking.—We explain a supply interruption at Dundee on Christmas Eve.—An interesting supply scheme for small villages has been inaugurated in Cheshire.—The Bolton new power station is approaching completion. (Page 28.)

**The Portsmouth Fire.**—At the inquiry into the circumstances of the fatal fire at Portsmouth Dockyard, Mr. A. G. Hiscock, the Corporation mains engineer, said that the fact that the fuses controlling the supply of the northern and southern portions of the building remained intact, and that the electrical system had nothing to do with the fire. Other witnesses described the conditions as favourable to spontaneous combustion.



## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JANUARY 8TH.

*Institution of Electrical Engineers.*

8 p.m. "British Practice in the Construction of High-Tension Overhead Transmission Lines," by B. Welbourn.

SATURDAY, JANUARY 10TH.

*Birmingham and District Electric Club.*

7 p.m. At Swan Hotel, New Street. Presidential Address by Mr. W. Y. Anderson.

MONDAY, JANUARY 12TH.

*Institution of Post Office Electrical Engineers.*

6 p.m. At Institution of Electrical Engineers, Victoria Embankment. "The Loading of Aerial Lines and the Electrical Constants of Loaded Circuits," by J. G. Hill.

*Institution of Electrical Engineers: Newcastle Section.*

8 p.m. At Armstrong College. "Inductance and Induction Coils in Industrial Work," by E. P. Hollis.

TUESDAY, JANUARY 13TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At University. "British Practice in the Construction of High-Tension Overhead Transmission Lines," by B. Welbourn.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At 207 Bath Street, Glasgow. "The Employment of Power in H.M. Post Office," by H. C. Gunton.

WEDNESDAY, JANUARY 14TH.

*Royal Society of Arts.*

5 p.m. Juvenile Lecture II. "Electric Vibrations and Wireless Telegraphy," by R. P. Howgrave-Graham.

*Institution of Electrical Engineers: Yorkshire Section.*

7 p.m. At Philosophical Hall, Leeds.

### The London Electrical Engineers.

(TO-DAY) THURSDAY, JANUARY 8TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, JANUARY 9TH.—D. Company. Technical Instruction, 7.30 to 9.30 p.m. Special Class on Crossley Engine, 7 to 8 p.m.

SATURDAY, JANUARY 10TH.—Headquarters open from 10 a.m. till noon.

MONDAY, JANUARY 12TH.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, JANUARY 13TH.—B. Company. Technical Instruction, 7 to 10 p.m.

WEDNESDAY, JANUARY 14TH.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, JANUARY 15TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, DECEMBER 16TH.—D. Company. Special Class on Crossley Engine and Technical Instruction, 7 to 9.30 p.m.

SATURDAY, DECEMBER 17TH.—Headquarters open from 10 a.m. till 12 noon.

## THREATENED STRIKE OF ELECTRICAL WORKERS

### Negotiations broken off

MATTERS have been proceeding quietly since the reply of the Electrical Trades Union to the London Electrical Masters' Association, given on page 717 of our issue for December 18th, 1913, but the present position is that negotiations between the Masters' Association and the Union have been broken off. In an endeavour, however, to arrive at some uniformity in the minimum rates of wages and terms of employment in the electrical trade, which it is now realised has reached an acute stage, the Committee of the London Electrical Masters' Association has sent out an invitation to all employers of electrical workmen, union and non-union, asking them to arrange that one delegate for every twenty of their employees should attend a meeting to be held at Caxton Hall on January 27th, in order that the position can be fully explained and discussed. At this meeting it is suggested that the men, union and non-union, should appoint a committee to confer with the Committee of the London Electrical Masters' Association, and endeavour to agree upon a recognised minimum rate of wages for each grade, terms of employment, &c. At the same time the London Electrical Masters' Association has sent out the poster reproduced below, which, it is suggested, employers of electrical workmen should fix in their works, announcing this meeting.

The breaking-off of negotiations has been due to the refusal of the Electrical Trades Union to meet the London Electrical Masters' Association with the understanding that the rights of non-union men should be recognised; it is on this point that the present climax has arisen. It is true that during the past three or four weeks there have been a number of accessions to the ranks of union workmen, owing to promises that the Union will make efforts to increase their wages, but there is absolutely no doubt that by far the greater proportion of the wiremen and other electrical workers in London do not belong to the Union, and that comparatively few of the better and more able class of wiremen have joined it. Obviously the masters must study the interests of these men. The action of the London Electrical Masters' Association should particularly appeal to them, inasmuch as the fixing of an increased minimum wage will undoubtedly be detrimental to the better class of workers. If masters are compelled to pay higher rates to wiremen generally, and if

the men with less experience and ability are to be paid wages as high as the more efficient workmen are already earning, the increase in the weekly wages bill will be such that the masters will be forced to adhere to the Trade Union minimum even in the case of a great number of their better-class workmen, who, under present conditions, receive considerably more than the existing Trade Union rate. The prospects of advance of the cleverer and more energetic men among the younger workers would also be materially diminished. In fact, the interests of the masters and of all the wiremen, with the exception of a few of the less efficient among them who belong to the Union, are absolutely identical.

The action of the masters demonstrates beyond doubt their desire to put the whole position upon a satisfactory and permanent basis. That conditions at present are chaotic cannot be denied, and the foolish state to which things have come is well shown by an incident which happened quite recently in the case of a large installation. Here a firm of electrical wiring contractors had secured the contract for the

## NOTICE.

THE LONDON ELECTRICAL MASTERS ASSOCIATION being desirous of improving the status of all electrical Workers, (whether connected with any organisation or not), and the general terms of employment and wages, desire you to send a delegate or delegates to meet them, each delegate representing about 20 men.

At the Meeting which will be held on Tuesday, Jan. 27, at 8 p.m. at Caxton Hall all matters with reference to employment will be openly discussed, when it is hoped that a Committee of the Men and the London Electrical Masters Association will be formed to draw up a code of Working Rules, fix a scale of Minimum Wages, and settle other terms of employment.

The Delegates to be ELECTRICAL WORKERS and the names and addresses of those selected should be forwarded through the employer to Mr. L. G. TATE, Secretary of the London Electrical Masters Association, 20 Bechlersbury, E.C. not later than Monday, January 19th, when admission tickets for the meeting will be forwarded.

electrical installation, but a large amount of temporary lighting was required during the course of the building operations. The contractors for the building, it so happened, have a very efficient wiring department of their own, and employ both union and non-union men. With a view to expediting the building operations, a gang of wiremen, who happened to be non-union men, was sent by the builders to fit up the temporary lighting, but no sooner had they appeared on the job than the men of the electrical contractors for the permanent installation intimated that unless union men were sent they would cease work. The exigencies of time prevented the matter being fought, and the builders being in the fortunate position of having union men to send, did so, and the incident closed, but a lasting solution must be found for these irritating and petty actions on the part of union workers if the industry is to be managed on anything approaching commercial lines.

It is probably common knowledge now that the London Master Builders' Association is also dealing with this question of sectional "sympathetic" strikes, which has been brought more prominently to the fore in the building trades as a consequence of what happened at the Pearl building, and in one or two other cases round about London. Under the rules of the London Electrical Masters' Association, it is open to that body to affiliate with other bodies, but no decision has yet been come to whether they will affiliate with the London Master Builders' Association. In any case, however, it would seem probable that a cordial working understanding between the two Associations will be arrived at to deal with the present situation.

**Accident at the Westinghouse Works.**—On Monday afternoon a fatal accident occurred at the Trafford Park Works of the British Westinghouse Co., when a flywheel attached to a motor-generator in the dynamo testing department suddenly burst, hurling fragments of iron considerable distances, killing a man named Henry Spokes and injuring a dozen others. Portions of the flywheel went through the roof and were found 500 yards away. The flywheel is stated to have been 8 ft. in diameter, weighing 3 tons, and to have been running at 600 r.p.m.

## DRURY LANE PANTOMIME

ACCORDING to our daily contemporaries, every pantomime at Drury Lane excels those that have gone before, and although it is not the province of an electrical engineering journal to criticise or praise any example of the dramatic art, yet we can affirm that the effects produced by the aid of electricity have never been equal to those now shown twice every day in *The Sleeping Beauty Re-awakened*.

There are two great scenes to which attention may be specially drawn. The first is that entitled, "Beauty's Awakening," in which the Princess is discovered asleep on a gorgeous settee covered by a canopy. By the aid of Puck she dreams of all the fairy stories that have ever been invented, and by the aid of a transparent curtain and some ingenious machinery the audience is enabled to share the delight of these visions. At the beginning of the scene there is no light behind the gauze curtain, but when the lights are turned on the curtain seems to disappear, and it becomes possible for the audience to see the long procession of characters so dear to the juvenile mind. Each character rises from the stage and moves steadily upward at an angle of about 30°, either to the right or the left, and finally disappears. It looks very mysterious, but is quite simple in reality, for behind the gauze are two moving staircases very similar to those in use on the tube railways, but, of course, much smaller. Each consists of a Gandy belt with oak slats and pulleys at the top and bottom. At intervals along the belt are fixed steps, and on these the performers stand, getting on to the staircase at the lower end and off at the top, finally descending to the stage proper by fixed steps. For driving the staircase a 5-h.p. Waygood motor is employed, which actuates the pulleys through worm gearing. Each staircase measures 18 ft. in length and its upper end is 12 ft. from the stage. A substantial iron framework carries all the mechanism, including a double pole switch, cut-out, starter and motor, and merely has to be moved into place to be ready for action.

Current is conveyed to the motor by a length of flex with a plug attached, the latter fitting into a socket provided for the purpose and fixed in the stage. Each staircase accommodates about six performers at one time.

Among those who take part in these processions are some who represent fairies and carry torches which appear to flame with a bright blue light. In the head of each torch there is a small electric lamp supplied by a dry battery concealed in the handle. The space containing the lamp is covered over with gelatine and blue silk, and projecting vertically from it are other small pieces of silk supported on the extremities of spiral springs. This device is so ingenious that it is difficult to realise at even a short distance that the torch is not really burning.

The other great scene to which we have alluded is that known as the forest scene. The hero, having crossed a chasm by way of a frail rustic bridge, defeats his pursuers by cutting the bridge down with an axe. Evil spirits then set fire to the forest, and the escape of both the Princess and her lover is cut off.

At this critical time the pursuers hit upon the happy idea of felling certain trees, which, falling across the chasm, place the enemy in command of the situation, and the trees are at once utilised as bridges. Obviously it would not do for the affair to terminate thus unfortunately, and Puck therefore commands the immediate appearance of a beautiful crystal bridge, which rises from the depths of the chasm and provides the happy pair with a path to freedom. We disclose no secret when we say that the evil spirits and Puck are enabled to perform all these wonderful feats by the aid of the electrical engineer. The forest fire is most realistic, and is arranged in the following manner. In various pieces of scenery built to represent banks of earth with bracken growing on top, there are fixed some forty-eight electric fans situated so as to produce a powerful current of air in an upward direction. Just above these fans are numerous amber and red lamps arranged in four circuits. Above these, again, wire netting is stretched, and tied to it are many orange and red silk streamers. Furthermore, perforated steam pipes are hidden in the banks. At exactly the right moment the coloured lamps are brought into incandescence through dimming resistances, thus producing the effect of a fire starting and gradually burning up more fiercely. Next, the fans are started, and the up-current of air blows out the silk streamers in such a manner as to provide an excellent imitation of flames. Moreover, the

noise made by the fans heightens the illusion, and the fire appears to rage with great fierceness. The finishing touch is given by the clouds of steam emitted by the hidden pipes. Rotatory resistances are also provided, and these enable the requisite flickering effect to be obtained. In all, there are twelve of these banks, all permanently wired and provided with a separate circuit and fuse for each fan.

The trees felled to bridge the chasm also appear to burn, and they presented an interesting problem, for it was not found practicable to provide them with fans. Each is therefore provided with an iron air duct, the top of which consists of wire netting to which the silk streamers are tied. Inside there are four circuits of coloured lamps, fifty-six in each tree, and a perforated steam-pipe. The trees are hinged at their lower ends, and air is blown into them through flexible canvas ducts, the blast being provided by an Electric Ordnance blower and motor of 1½ h.p.

Leading up to the crystal bridge is a short flight of steps, which, at the beginning of the scene, is covered with a cloth, the latter being withdrawn when the bridge is brought into position. The bridge and steps are solidly constructed of angle iron, the treads, risers and floor consisting of ½-in. sheet-glass with roughed surface. Underneath are some 360 10-in. metal filament tubular lamps carried in reflectors. These lamps are brought up gradually to full brightness through special resistances. The posts and rails of the bridge are hollow, and are covered with the translucent fabric argentine. Within them are tubular lamps coloured in such a manner as to give the appearance of mother of pearl. The bridge itself is concealed beneath the stage until required, and is then raised into place by means of one of the electric lifts which constitutes the middle portion of the stage.

An interesting feature is the steam supply. Steam is raised in the theatre boiler and brought to two points on the stage. Temporary flexible connections are then made to distributors of which there are two, each having eight ways. Sub-connections run from the distributors to the points required, instantaneous couplings of an ingenious type being employed. In the forest fire scene, it is interesting to note, some 800 ft. of steam hose is made use of. For the same scene there are also 120 special stage plugs and 1,500 ft. of special stage flex capable of carrying 15 amperes. This flex was specially made for Drury Lane by Messrs. Baxter and Caunter, and is protected with an outer covering of treated hemp braiding.

The real water fountain, prominent in one of the big scenes, is actuated by an electrically driven pump.

We have described above a few of the principal effects now being employed at Drury Lane, but they give but a slight indication of the uses to which electricity is put in the pantomime. Of arc and incandescent lamps there is no end, and in one instance the former have been displaced by two 2,000-c.p. ½-watt lamps suspended in a huge cradle from the flies and invisible from the front.

There are many parts of the performance of great beauty, and the delightful colour schemes are such as to make a very vivid impression on the minds of all who witness it.

The management of Drury Lane have set themselves a difficult task if they intend to produce finer effects next year.

In concluding this article we wish to thank the management, and particularly Mr. Ernest D'Auban, the Stage Manager, and Mr. H. Mather, the Theatre Electrician, for enabling us to obtain the necessary data.

**Cable Box Explosion at Brixton.**—Last Thursday afternoon an explosion affecting four boxes connected with the L.C.C. tramway feeders occurred at Acre Lane, Brixton. Town gas had accumulated in the cable ducts, and was fired by some means unknown. There was no interruption in the supply, although two of the man-hole covers were violently blown up, and a boy walking on one of them was cut about the legs.

**Finsbury Technical College O.S.A. Magazine.**—The most recent issue of this bright periodical contains some interesting matter, largely made up of short notes relating to the doings of the Association and its members. There is a biography of Mr. E. Kilburn Scott, who was awarded the O.S.A. medal for the session 1912-13, for his Paper, "Electric Cables for Shafts in Mines," read before the London Branch of the Mining Electrical Engineers. There were six Papers submitted in the competition. We note that a dance is to be held at the Caxton Hall on Saturday, February 14th, while on Friday, March 27th, there is to be a smoking concert at the Waldorf Hotel. The issue also contains the conclusion of an article on the Dover Harbour Works by Mr. J. D. Johns, some book reviews, a photograph of Mr. Kilburn Scott, and some smart pen sketches of visitors at the annual dinner.

## PREVENTION OF STRIKES AT ELECTRICITY WORKS

### Action by North Metropolitan Power Co.

THE North Metropolitan Electric Power Supply Co. has apparently decided to take some action to provide against the possibility of a cessation of the supply in their area through a strike of their employees. The effect of the strikes of municipal workers at Liverpool in 1912, and in Leeds and Blackburn more recently, have brought to the front the need for something to be done to deal with those special classes of workmen employed by municipalities and companies supplying electricity, gas and water, the stoppage of which through strikes would be serious.

As we have pointed out on previous occasions, there already exists Section 4 of the Conspiracy and Protection of Property Act of 1875, which provides that where a person employed by a municipal authority, company or contractor upon whom is imposed by Act of Parliament the duty of supplying gas or water, breaks a contract of service, knowing, or having reasonable cause to believe, that the probable consequence of his so doing, either alone or in combination with others, will be to interrupt the supply of gas or water, he shall be liable to a fine up to £20, or three months' imprisonment with or without hard labour. In its Bill, which will come before Parliament next session, the North Metropolitan Electric Power Supply Co. has, in conjunction with the North Metropolitan Electrical Power Distribution Co., inserted the following clause, which, it will be seen, is an adaptation of the above section to the undertakings of these companies.

(1) Where any person employed by the Two Companies wilfully and maliciously breaks a contract of service with the Two Companies, knowing, or having reasonable cause to believe, that the probable consequence of his so doing, either alone or in combination with others, will be to deprive the inhabitants of a city, borough, town or place within the area of supply of the Two Companies wholly or to a great extent of their supply of electricity, he shall on conviction thereof by a court of summary jurisdiction or on indictment, as hereinafter mentioned, be liable to pay a penalty not exceeding twenty pounds, or to be imprisoned for a term not exceeding three months, with or without hard labour. The Two Companies shall cause to be posted up at the works of the Two Companies a printed copy of this section in some conspicuous place where the same may

be conveniently read by the persons employed, and as often as such copy becomes defaced, obliterated, or destroyed, shall cause it to be renewed with all reasonable dispatch.

(2) If the Two Companies make default in complying with the provisions of this section in relation to such notice as aforesaid, they shall incur on summary conviction a penalty not exceeding five pounds for every day during which such default continues, and every person who unlawfully injures, defaces, or covers up and notice so posted up as aforesaid in pursuance of this section shall be liable on summary conviction to a penalty not exceeding forty shillings.

(3) Where a person is accused before a court of summary jurisdiction of any offence made punishable by this section, and for which a penalty amounting to twenty pounds or imprisonment is imposed, the accused may, on appearing before the court of summary jurisdiction, declare that he objects to being tried for such offence by a court of summary jurisdiction, and thereupon the court of summary jurisdiction may deal with the case in all respects as if the accused were charged with an indictable offence, and not an offence punishable on summary conviction, and the offence may be prosecuted on indictment accordingly.

Section 4 of the Conspiracy and Protection of Property Act, 1875, was not, for some reason, put into effect in connection with the recent municipal strikes which affected gas and water supplies. At the same time, Parliament may consider the application of this clause to the electrical industry too large a matter to be dealt with piecemeal in individual private Bills.

In the I.M.E.A. Bill last year, a similar clause was included.

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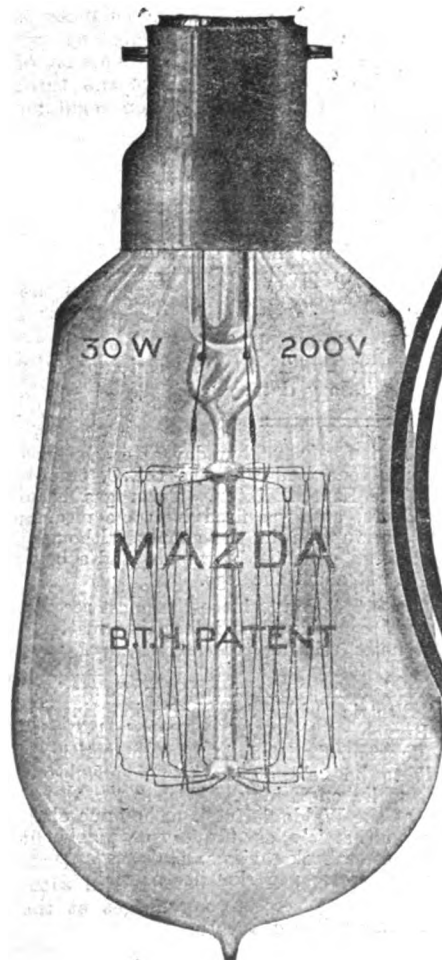
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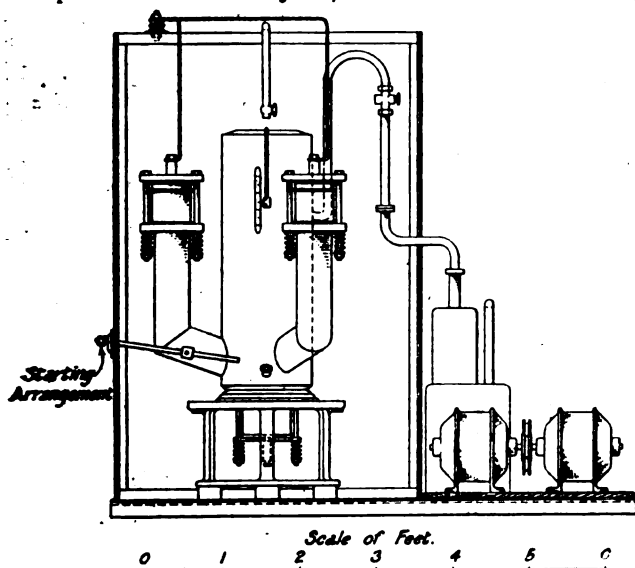
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### A 100-KW. MERCURY-VAPOUR RECTIFIER

Great progress is being made in the development of the mercury-vapour rectifier for heavy outputs, and already, we are informed, the General Electric Co. of America are experimenting with a 1,000-kw. rectifier capable of delivering from 600 to 700 amperes continuously at pressures up to 2,700 volts direct-current, and even 1,400 amperes for short intervals at about 850 volts, corresponding to an output of 1,200 kw. In Germany, also, considerable progress has been made, and in the *Elektrotechnische Zeitschrift* for December 25th, Dr. K. Norden describes the standard three-phase 100-kw. model of the Allgemeine Elektrizitäts Gesellschaft, and gives the results of a test carried out by Prof. Orlich.

This rectifier, as shown in the figure, comprises a steel cylinder 3 ft. 3 in. high and 16½ in. in diameter, with a steel vessel let into the top for containing water. The cylinder forms the condensing chamber of the rectifier, and the evaporation of the water in the inner vessel keeps it from overheating. The iron anodes are in three upwardly projecting arms spaced equidistant round the lower circumference of the cylinder. The vacuum joints on the tops of these are made with concentric lead rings. The mercury cathode is contained in a vessel attached to the bottom of the cylinder in a similar manner. A vacuum pump is connected to the cylinder, and is run continuously during operation, while the water vessel has to be refilled about once every twenty-four hours. The arc is started by hand with the aid of an auxiliary electrode, and can be observed through a little mica window let into the steel cylinder.

The tests made by Prof. Orlich were carried out with three-phase current at 50 cycles, the direct-current load being



GENERAL ARRANGEMENT OF 100 KW. MERCURY VAPOUR RECTIFIER.

connected between the cathode and the neutral point of the three-phase transformer to which the rectifier was connected. No choking coil was inserted in the direct-current circuit, but the output was measured by movable coil instruments of the d'Arsonval type, so that only the true direct-current output was measured. A very steady loading was obtained, and the rectifier was run at 100-kw. output for four hours continuously. An average reading was:—A.C. volts, 554; amperes, 170; kw., 108.9; D.C. volts, 888; amperes, 290; kw., 96.1; efficiency, 90.1 per cent. The efficiency averaged well over 90 per cent. during the four hours, exclusive of the small amount of power required to run the vacuum pump. During the whole of this period it was not necessary to restart the arc by bringing the auxiliary electrode into use. The last hour was run with the pump at a standstill and the connecting cock closed, but the vacuum became gradually poorer, and it was necessary to restart the pump for further readings. At an output of 49 kw., the efficiency was 90.6 per cent.; at 9.9 kw, 89 per cent.; and at 2.3 kw. (65 amps.), 86 per cent. The arc was unstable at 5 amperes, and could not be maintained at 3 amperes. The temperature of the rectifier during operation remained within the permissible limit.

The rectifier is particularly adapted for charging or running in parallel with a 220-volt battery, as the charging pressure of such a battery would reach 825 volts, and the rectifier runs equally well at the lower pressure.

### THE PHASE BALANCER

IN order to counteract the unbalancing effect produced by single-phase loads on three-phase systems, a machine consisting of a synchronous condenser, i.e., an over-excited synchronous motor, in series with a three-phase booster on the same shaft, may be used. A description of the action of this machine is given in the *General Electrical Review* (Schenectady). A satisfactory explanation is obtained by regarding a single-phase current or field as being resolvable into two polyphase components with opposite phase rotation. An unbalanced load on a polyphase system is the combination of a true polyphase load with a single-phase load, and the latter may be resolved into its polyphase constituents, one of which has the same rotation as the polyphase load and therefore becomes part of it, while the other has opposite phase rotation. If, therefore, some means are provided for supplying to a polyphase system a current or voltage with opposite phase rotation which neutralises the corresponding component of the unbalanced load, it is evident that the result is a complete correction of the unbalancing. Now, since any induction or synchronous motor with squirrel-cage has a tendency to maintain an approximate balance of voltage in a polyphase system to which it is connected, by generating a balanced back E.M.F., which causes a current to flow if the terminal voltage is unbalanced, it is seen that if an E.M.F. is introduced in series with each phase to overcome the impedance of the winding, complete balancing is possible. If the only object of the phase balancer were to correct the unbalancing in current and voltage which is due to single-phase loads in some other part of the system, it would only be necessary to use a machine of the induction type with a squirrel-cage, and to direct-connect to it a polyphase booster with sufficient capacity to overcome the impedance drop in the windings of the main machine. If the single-phase load were of a definite and known power factor, the booster might have a single field of the ordinary kind; however, if the power factor of the load fluctuates at the same time as the current, means must be provided for changing the phase, as well as the strength of the E.M.F. introduced by the booster. This is done by providing the booster with a two-phase field winding and two separate sources of excitation. If the regulation of the balancer is to be automatic, the two booster fields are controlled by two voltage regulators adjusted so as to maintain the equality of the two phases with the third. The voltage of the third phase is then controlled by the main power station regulator working on the generator fields.

### MUNICIPAL ELECTRICITY SUPPLY Wiring Powers: Showrooms

WE referred in our issue for November 27th last to the general features of the electricity supply bills which will come before Parliament next session, but a perusal of the bills themselves brings out the interesting fact that several corporations are applying for municipal wiring powers with the proviso that all wiring of consumers' premises, as well as all sales of electrical fittings, shall be carried out through contractors, but powers are taken for the direct hiring of apparatus to the consumer by the electricity department. This point of view has been frequently expressed by central station engineers in the many discussions which have taken place in the long dispute between municipalities and contractors, and may eventually prove to be the solution of the difficulty. Quite a number of central station engineers feel they are considerably handicapped in their fight against gas, in that they have not the powers to hire out motors and fittings, and so far as these particular central station engineers are concerned, they are quite content to work through contractors for all wiring work and actual sales of fittings. The corporations which are asking for these powers include Weymouth, Barnsley, Worthing and St. Anne's-on-Sea. These same authorities and one or two others also take powers to approve the quality of material and the workmanship of installations carried out by wiring contractors. Several local authorities are further asking for powers to fit up showrooms and spend money upon advertising their electricity undertakings, a policy which, if persisted in without Parliamentary sanction, may lead to surcharges at the hands of the Local Government Board auditor.

## STORAGE BATTERY WITH COUNTER E.M.F. CELLS

AN interesting 150-cell 5,750-ampere-hour storage battery, the discharge of which is adjusted by remote controlled short-circuiting switches across twenty-four counter E.M.F. cells, is described in the *Electrical World* (New York). The battery is in use by the Union Electric Light & Power Co. of St. Louis, Mo., and is automatically thrown on to the distributing system when needed by low-pressure relays. The main battery, comprising 150 lead cells each with sixty-one plates in lead-lined boxes 49 in. long, 23 in. wide and 49 in. high, rests on cast sulphur blocks, coated with an acid-resisting paint. Porcelain tiles are embedded in the sulphur, and these carry  $4\frac{1}{2}$  in. porcelain cylinders with annular glass oil cups. The counter cells are made up of spun-type plates, both sets alike, contained in 41-plate tanks, 34 in. by 22 in. Most of these cells contain fifteen plates, but the last cells to be short-circuited have twenty-three plates and the next twenty-one plates. It is found that the energy lost in the cells is chiefly due to heating and dissociation of the electrolyte, and not in the formation of much active material. These counter cells are arranged twelve on the positive and twelve on the negative side of the main battery, and are short-circuited in groups of two, each pair being connected by 4 in. by 0.5 in. copper bars to its switch outside the battery room. Besides being controlled by push buttons from the switchboard, the switches may be worked by hand in emergency. The main battery leads are connected to the 220-volt three-wire distributing system through 12,000 ampere solenoid-operated switches arranged with low-pressure relays and hand control. When the 110/220-volt system pressure falls below the pre-determined figure, these relays cause the main switches to close, at once connecting the battery to the line, regardless of the voltage difference between line and battery, since the counter cells serve as a cushion, building up a reverse E.M.F. to prevent a sudden current rush. Even with the system at 240 volts between outers and the battery pressure 300 volts or more, it is said that connection has repeatedly been closed through the counter cells without appreciable voltage or current variation.

In succession, the attendant then short-circuits counter-cells until the battery is carrying its apportioned load. Its rating is as follows: 5,570 amperes for sixty minutes; 11,500 amperes for twenty minutes; 17,250 amperes for ten minutes; 23,000 amperes for six minutes. The capacity in kilowatts is: At the 5,750-ampere rate, 1,500 kw.; at the 11,500-ampere rate, 1,470 kw.; at the 23,000-ampere rate, 5,865 kw.

## METAL FILAMENT LAMP PATENTS

THE grant of the three patents by the Julius Pintsch A.-G. relating to the production of ductile tungsten filaments and numbered 5,026, 5,027 and 5,028, of 1912, has been refused by the Comptroller. Opposition was entered by the B.T.-H. Co. on the ground that no invention was disclosed, but that a special method covered by previous patents of a more general nature was made. The B.T.-H. Co. cited several patents as being anticipatory, including Nos. 24,179, of 1906, by F. W. Le Tall, to whom it was communicated by A. Lederer, of Vienna; 8,841, of 1907, by the A.E.G.; 8,421, of 1908, by the Wolfram Lampen A.-G., of Augsburg; and 18,467, of 1911, by W. D. Coolidge. An appeal to the Law Officer against the Comptroller's refusal to grant the patents has been entered.

The patents in question, Nos. 5,026 of 1912, 5,027 of 1912, and 5,028 of 1912, which were taken out in the name of J. Hubers, were communicated by the Julius Pintsch A.-G. of Berlin. Briefly they may be summarised as describing a process in which a compound of tungsten is mixed with between 1 per cent. and 5 per cent. of an oxide or an equivalent proportion of a compound of thorium or other rare earth metal, an alkaline earth metal or magnesium or zirconium, or a mixture. The mass is squirted and reduced in hydrogen, so as to avoid the formation of crystalline particles. The metals are finally alloyed together. Alternatively, colloidal tungsten may be used. In the second specification processes are covered for compressing the preliminary ductile filament, obtained as above described, by passing it through drawstones or rollers and subjecting it to drawing or rolling. According to the third specification, a thick wire or rod is formed from the paste, as in specification 5,026/12, and is drawn or rolled.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,373.

It is proposed to use the lead covering of three-phase, three-core power cables (which are laid solid in bitumen) for single-phase lighting at 260 volts. The three phases would be practically balanced, and the wiring for lights would be single lead covered. The machines are 450 volts, 50 cycles, with neutral and cables earthed at power station. The lead covering at the end of each cable is used for earthing. The longest length of cable is about 450 yards. What are the chief points to bear in mind on such a scheme? Would it be an advantage to earth each cable at the far end?—"PHASE."

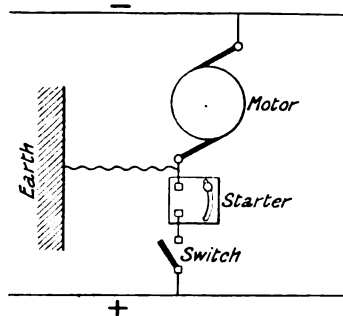
(Replies must be received not later than first post, Thursday, January 15th.)

### ANSWERS TO No. 1,371.

A 230 volt installation is running on a circuit containing several electric cranes and other motors. An earth is reported on the main board, and in investigating this, two 230 volt 16 c.p. lamps in series were connected between the negative main and earth, and showed a red glow. When they ceased to glow they were tried on the positive side and glowed again. This change over occurred several times a day. Sometimes, however, the lamps would show a full light, which indicated that about 460 volts was present between one pole and earth. How can this be explained?—CONSTANT READER.

The first award (10s.) is made to "MARP," for the following reply:—

The fact that the installation includes an electric crane provides the key to this problem. The "earth" must have been situated in the electrical equipment of the crane, between the motor and starting switch; also, the crane in question must have been in use during the tests. The somewhat surprising effects observed are explained as follows:—I assume the motor switch to be connected on the positive side of the motor, the other side of the latter



being in direct connection with the negative main. If, while the motor is stationary, a connection is made from the "earthed" lamps to the negative main, no current will flow. The closing of the motor switch will put the lamps across the mains in parallel with the motor. Consequently the lamps will glow dimly until the motor is stopped again. On making



the connection from the lamps to the positive main the lamps would again light up dimly, owing to their being then in series with the motor armature, the resistance of which, when stationary, being negligible. If now, whilst the motor switch is still open, the motor is allowed to run backwards (during the operation of lowering whatever articles the crane is handling), it will generate an E.M.F. of approximately 230 volts, which, acting in conjunction with the mains pressure, will raise the pressure across the pilot-lamps' terminals to 460 volts, and cause both lamps to emit their normal candle power.

The accompanying sketch will enable the reader to follow the above explanation readily.

The second award (5s.) is made to "J. E. R. R.," who writes as follows:—

There appears to be in the first case a fault to earth on one of the crane motors, it being assumed that these are the only reversible motors on the circuit. That this is so is borne out by the reversing of the fault from one pole to the other. The fault is evidently on the armature circuit of one particular motor of a crane. It may be on the trolley wire insulators, or on the leads between trolley and motor or trolley wire and controller, or on one brush arm of motor. Of these places a faulty brush spindle insulator or trolley wire insulator are the most likely, though on some cranes grease and oil from the gears frequently cause earth faults on the wiring. It will be observed that the parts mentioned are the only ones that change from one pole to another, according to motor's direction of rotation. To locate the fault it will be necessary to try which crane brings on the earth by working each separately, then localising the motors. The second phenomena is not as much a fault as a bad or wrong connection. It is obviously due to the inductive voltage of some shunt field being broken without a discharge path. If the starters are rightly connected up, the shunt circuit should be permanently coupled across the armature circuit by feeding it from the first notch of the resistance through the no-volt release coil, but it may happen that some resistance coils are broken, in which case the permanent connection of armature and shunt is opened. It may be that some special connection of the starter or controller on one particular motor does not provide for the shunt being broken with a discharge path in parallel, which is a dangerous way of working, and to prevent breakdowns of the insulation a non-inductive discharge resistance should be at once inserted. It will be easy to see that this inductive voltage, which may be perhaps more than twice the normal voltage, will show to earth when it occurs at the moment when the earth exists on crane circuit. It will, however, be only a momentary rise, whereas the earth may keep on for some time. There is a possibility that the two faults may be on the one motor if there are reversible shunt-wound motors on this circuit, though this is not stated in the question. Knowledge of the local conditions will doubtless suggest a likely place where to look for the shunt field fault, but in any case it might be advisable to go round all the motors on this circuit and check up the connection, especially those of the shunt circuit.

## TECHNICAL AND COMMERCIAL EDUCATION, IN LONDON

A CROWDED meeting of London employers was held at the Mansion House on Monday, under the Chairmanship of the Rt. Hon. the Lord Mayor, when details of the London County Council's new scheme of evening continuation education were outlined. In spite of the large expense which has been incurred in this direction in the past, the general result of the work accomplished in the evening continuation schools has to be regarded as a failure, and the object of the meeting was to impress upon employers the necessity for their making some sacrifice in the way of allowing time off during the day time for their younger employees to continue the education which most of them abandon after leaving the elementary school at the age of fourteen or fifteen. The Council has now re-classified its evening-school work, and so far as technical work is concerned this is first started in what are now called junior technical schools, and is continued in the polytechnics. Mr. J. W. Gilbert, Chairman of the L.C.C. Education Committee, described the scheme, and speakers on the general question included Mr. J. A. Peace, President of the Board of Education, and the Marquis of Salisbury. One or two other gentlemen spoke as to the beneficial effects both to employers and employees of allowing time off in the day time to attend such classes.

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The owner of Patents Nos. 1,451 of 1908 for "Improvements in SUBMARINE SIGNALLING APPARATUS, 1,848 of 1908 for "New or improved apparatus for alternative WIRELESS TELEGRAPHY and TELEPHONY," and 14,775 of 1908, for "Improvements in transmitting apparatus for SUBMARINE SIGNALLING," is desirous of negotiating with interested parties for the granting of licences under them on reasonable terms. For information apply to LLOYD WISE & Co., 10 New Court, Lincoln's Inn, London, W.C.

## REMOVAL.

Mr. J. G. LORRAIN, M.I.E.E.,  
M.I.Mech.E., Chartered Patent  
Agent, has removed his office from Norfolk House, Norfolk  
Street, Strand, W.C., to  
Staple Inn Buildings, High Holborn, London, W.C.

## John E. Raworth,

Queen Anne's Chambers, Chartered Patent Agent  
39, Broadway, Westminster, London, S.W.

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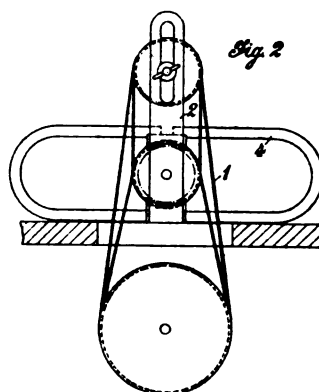
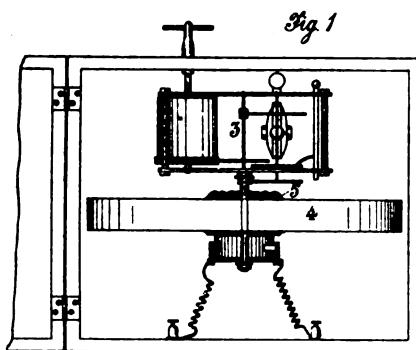
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Scale Reading.	Power Factor.	10 Amp. Range.	5 Amp. Range.
1100	1.0	.99 <sub>8</sub>	.99 <sub>8</sub>
800	1.0	.99 <sub>9</sub>	.99 <sub>9</sub>
400	1.0	.99 <sub>8</sub>	.99 <sub>7</sub>
550	0.5 lag.	.99 <sub>8</sub>	.99 <sub>8</sub>
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10-ampere  
Portable  
A.C. Wattmeter.



## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published January 1st, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

28,865/12. **Wireless Telegraph Transmitters.** G. MARCONI. A rotary disc discharger has its teeth equally spaced, or spaced in groups, and is mounted so that as one tooth passes one terminal of the circuit, another tooth (preferably that diametrically opposite the first) passes the other terminal. Air blasts are provided to blow out the sparks, and for large powers several discs may be mounted in series and all driven through gearing, or they may be arranged on a single shaft and connected in parallel. The discharger is used in a circuit tuned to the aerial circuit, but coupled to it through an intermediate tuned circuit. Six figures.

29,409/12. **Commutator Machines.** A. HEYLAND. To diminish the E.M.F.'s induced in the commutation zones of commutator machines for D.C. or A.C. circuits, a portion of all the zones is provided with auxiliary poles or coils, and another portion with recesses, open slots, or tunnels, which increases the magnetic reluctance and superposes the effects on those of the remaining commutating poles. As an example, in converters fixed points on an armature winding are connected to one circuit through slip-rings and to another circuit through the commutator brushes. The points on the winding from which connection is made are not distributed evenly. Four figures.

15,523/13. **Polyphase Synchronous Motors.** CROMPTON & Co. and H. BURGE. To start up and synchronise under load synchronous motors in which the armature has a main A.C. winding and a small D.C. exciting winding, a distributed closed circuit winding of the D.C. type is arranged on the field magnet so that it can act as an induction motor secondary at starting and as a field winding when the machine is up to speed. This is effected by providing two phase tappings, one for the D.C. excitation, which is applied through an adjustable resistance after the motor is run up to speed, and the other for a similar adjustable resistance, which is used at starting. One figure.

15,824/13. **Incandescent Lamps with no Bulb Pip.** WOLFRAM LAMPEN A.-G. The neck of the bulb is placed over a member carrying the leading-in wires, the stem for exhausting, and a mandrel. Heat is applied and the neck flattened, so as to seal in the wires, and at the same time the exhausting stem is fused to the bulb. Five figures.

19,439/13. **Combined Neon and Mercury Vapour Tubes.** G. CLAUDE. Neon and mercury vapour tubes are successively lighted and extinguished, so that, owing to the condensation of the mercury vapour by cooling, red, blue, and other coloured lights are obtained.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SIEMENS DYNAMO WORKS and WILSON [Pressure regulation of systems fed through rotary converters] 29,338/12; B.T.-H. Co. (*G.E.Co., U.S.A.*) [Wire drawing] 2,001/13; SIEMENS DYNAMO WORKS (*Siemens-Schuckert*) [Regulation] 11,267/13; MEIROWSKY & Co., A.-G. [Mica sheets] 15,568/13; GRAHAM and RICKETS [L.P. direct current from H.P. alternating current mains] 15,769/13; SIEMENS-SCHUCKERT [Paralleling] 25,073/13.

**Dynamos, Motors, and Transformers:** HOLLISTER [Dynamos for lighting and ignition combined] 28,748/12; SOC. ANON. DES ETABLISSEMENTS L. BLERIOT [Electro-magnets] 28,864/12; SIMMS [Magnetos for ignition and lighting combined] 29,581/12; B.T.-H. Co. (*G.E.Co., U.S.A.*) [Vapour rectifiers] 5,448/13; RAILING and COLF [Motors] 10,535/13; HOLLISTER [Magnetos] 27,355/13 and 27,356/13.

**Electrometallurgy and Electrochemistry:** CHARLTON [Rotary electro-plating apparatus] 30,047/12; WARDALL and MARCHANT [Furnaces] 2,718/13; EYERMANN [Furnaces] 9,381/13.

**Ignition:** GUYOT [Self-starters] 17,989/13.

**Incandescent Lamps:** B.T.-H. Co. (*G.E.Co., U.S.A.*), 2,901/13; ZSCHOCKE, 6,143/13.

**Instruments and Meters:** LAWSON [Mercury motor meters] 882/13; HANDCOCK, DYKES and DUDELL [Resonance operated apparatus] 16,998/13; CHAMBERLAIN & HOOKHAM and HOLDEN [Mercury motor meters] 18,474/13.

**Switchgear, Fuses and Fittings:** HIRST and BROOK [Motor controllers] 28,634/12; WADE (*Protective Signal Mfg. Co.*)

[Switches] 28,977/12; BEEMER [Switches for automobile electro-mechanical gear-changing] 88/13; BOTT [Securing incandescent lamps in their sockets] 9,579/13.

**Telephony and Telegraphy:** AUTO. TELEPHONE MFG. Co. (*Auto. Elec. Co., U.S.A.*) [Telephone systems] 29,357/12 and 29,387/12; O'HARE [Telephone receiver attachment] 1,259/13; WESTERN ELEC. Co. (*Western Elec. Co., U.S.A.*) [Telephone exchanges] 2,509/13; SIEMENS & HALSKE [Semi-automatic telephone circuits] 6,664/13; CONNER [Telephone receivers] 7,348/13; STERLING TELEPHONE Co. (*Telephon-Fabrik A.-G. vorm G. Berliner*) [Indicators, &c.] 21,965/13; SIGNAL-GES. [Wireless radiator for aeroplanes] 23,728/13; SIEMENS & HALSKE [Telephone systems] 27,452/13.

**Traction:** PARROCK [Operating railway and tramway points from the vehicles] 259/13; ACFIELD and COOKE [Signalling] 8,009/13.

**Miscellaneous:** NAYLOR and NAYLORGRAPH, LTD. [Advertising by day and night] 21,191/12 and 19,122/13; WEIGERT-STERN [Automatic control of the temperature of fluids] 23,758/12; B.T.-H. Co. (*G.E.Co., U.S.A.*) [Refractory materials] 29,389/12; SCHNEIDER [Submarine mines] 29,392/12; KRAUS [Electrostatic apparatus for cleaning grit, grains, seeds, &c.] 11,852/13; KIENZLE [Automatic lathes] 12,235/13; FAIRWEATHER (*Ges. für Elek. Industrie*) [Money boxes for prepayment meters, &c.] 16,128/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** GEBR. SIEMENS & Co. [Electrodes for search-lights] 28,296/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** A.-G. BROWN, BOVERI ET CIE. [H.P. sleeve insulators] 27,734/13.

**Electrochemistry:** FARBERWERKE VORM MEISTER, LUCIUS & BRÜNING [Nitrogen and its oxides] 28,737/13.

**Ignition:** ANSCHÜTZ [Magnetos] 22,527/13; SCHRÖTER [Interrupters] 28,535/13.

**Switchgear, &c.:** RENAULT [Controllers for variable speed dynamos] 27,477/13.

**Telegraphy:** BLONDEL [Locating radio-telegraphic "light-houses," &c.] 28,183/13.

**Miscellaneous:** D'AMICO [Coating aluminium proof against seawater, acids, and alkalis] 28,410/13; MASSON [Illuminated signals] 28,542/13; J. ZARUBA & Co. [Primary batteries] 28,734/13.

The following Amended Specification may now be obtained:—  
**Switchgear, Fuses and Fittings:** E. J. WILSON and CANDOLITE Co. [Imitation candles] 1,178/12.

### Grant of Patents Refused

5,026/12, 5,027/12, and 5,028/12. **Ductile Tungsten Filaments.** J. HUBERS (*Julius Pintsch A.-G.*). The opposition to the grant of these patents (*ELECTRICAL ENGINEERING*, June 26th, 1913, p. 386, and Aug. 21st, 1913, p. 481, Vol. IX.) has been successful and the grant refused. The opposer was the B.T.-H. Co. An appeal has been lodged: see also p. 20.

### Grant of Patent Allowed

8,045/12. **Variable-Speed Dynamos.** C. A. VANDERVELL and A. H. MIDDLEY.

### Amendments made and Allowed

19,948/11. **Synchronous Rotary Spark Gap Transmitters for Wireless.** L. ROUZET.

22,342/04. **Arc Lamp Carbons.** KÖRTING & MATHIESEN A.-G.

### Application for Restoration of Lapsed Patent

4,030/08. **Concrete Telegraph Poles.** F. H. TIDNAM. The patentee seeks restoration of this patent, which expired on July 9th, 1912, as the renewal fee was not paid.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** A. ECKSTEIN and A. E. ANGOLD [Suspension] 16,501/00; W. J. DAVY [Series lamps] 20,019/04.

**Dynamos and Motors:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Insulating studs for collector rings] 20,929/06.

**Meters:** E. DU BOIS [Prepayment] 20,072/03.

**Switchgear, Fuses and Fittings:** VERITYS', LTD., and A. E. GOTT [Motor-starter] 18,620/05.

**Traction:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Track circuit signalling in which double frequency currents are used] 20,542/06, and 21,766/08; L. BAILEY [Trolley collectors] 19,357/08.

## ELECTRIC TRACTION NOTES

There has been considerable progress in the work in connection with conversion of the London local lines of the London & North Western Railway, and the section from Earl's Court to Willesden will be running at an early date. This is being equipped on the same system as the District Railway with third and fourth rails of special low-carbon steel weighing 105 lb. per yd., supported on Doulton porcelain insulators attached to the sleepers by malleable iron clips. Special anchor insulators are provided at intervals to prevent creepage. The rails are being bonded with 1.4 sq. in. flexible Forest City bonds, and the jumper cables are of Henley's manufacture laid solid in bitumenised fibre troughs, and fitted with special sealing terminals designed by Mr. F. A. Cortez-Leigh (Chief Electrical Engineer to the L. & N.W. Ry.). The initial rolling stock for this section, consisting of four trains, was built by the Metropolitan Railway Carriage, Wagon and Finance Co., and the standard trains will be made up of one motor-coach, one trailer, and one driving trailer of the centre corridor type with all main control gear in a steel compartment in the motor-coach. Multiple unit control will be used so that two or more trains may be coupled together and any length of train driven from either end. The motors, on each motor coach, supplied by Siemens Bros. Dynamo Works, are four in number, each rated at 240 h.p. Pending the completion of the Company's own generating station at Stonebridge Park, current will be purchased. Progress is, however, being made with this power house, which is expected to be ready to receive the plant shortly. It will be equipped with five 5,000-kw. Siemens alternators driven by Westinghouse steam turbines; these will generate at 11,000 volts 25 cycles. There will be twenty Babcock & Wilcox boilers and elaborate coal and ash handling plant, for which the contract has not yet been announced. The substation plant will be supplied by the British Thomson-Houston Co., Ltd. 750-kw. and 1,000-kw. self-synchronising rotary-converters will be used in conjunction with transformers of the British Electric Transformer Co.'s make, and there will be a large battery controlled by a reversible booster in each substation. The feeder cables will be three-core paper-insulated, lead-covered, fixed in wood troughs on short posts above ground, and supplied by the British Insulated & Helsby Cable Co. Work is progressing on the Watford, Euston and Broad Street sections, and the first instalment of rolling stock for these will be electrically equipped by the Maschinenfabrik Oerlikon. Forty-three motor-coaches are on order from the Metropolitan Carriage & Wagon Co., and thirty-eight trailers and the same number of driving trailers are being built at the L. & N.W. Ry.'s Wolverton works.

The Lancashire and Yorkshire Railway have decided, on the advice of Mr. J. A. Aspinall, General Manager, to convert their line from Manchester to Bury to electric traction, and will use the third rail continuous-current system, such as is employed on their Liverpool-Southport line. The line in question is 9½ miles in length, with a short tunnel, and with stations at Woodlands Road, Crumpshall, Heaton Park, Prestwich and Radcliffe, and runs out at Victoria Station, Manchester. There will probably be a ten-minute service, augmented at the rush hours. The line is a busy one, and fares will be low to meet tramway competition. It is expected that the conversion will be complete in about twelve months, and that further extensions will follow. The scheme is quite distinct from the electrical working of the Bury-Holcombe branch, which is already being run experimentally on the high-tension continuous-current system with an overhead conductor.

The Board of Trade has at last condemned the Dolter surface contact system run by the Hastings Tramways Co. along the sea front. We have referred from time to time to the circumstances connected with this line, which the company has, for quite a considerable period, been anxious to abandon and substitute the overhead system. On the other hand, the Corporation would not agree to the surface contact system being abandoned unless the conduit system were substituted, but this the company maintained would be far too expensive to make it a profitable concern. Matters have therefore drifted on, and the long expected action of the Board of Trade has now been taken. Therefore, unless some agreement is come to between the Company and the Corporation, cars along the sea front will be removed altogether.

The City of Oxford Electric Tramways Co., which is owned by the National Electric Construction Co., now proposes to remove the existing horse tramways and provide motor omnibuses. This decision has been arrived at, apparently, owing to the inability to raise the capital for the conversion of the horse tramways to electric traction, and also in the absence of any agreement with the Corporation as to a modified scheme of electric traction.

We are informed by International Railphones, Ltd., that the Swiss Federal Railways have placed a third trial order for "K. K." detectors. They also inform us that with the aid of this instrument it has been found possible to transmit telegraphic messages through the St. Gothard Tunnel, which had previously been found impossible.

The L.C.C. is applying to the Board of Trade for permission to run additional trailer cars on its southern routes, in consequence of the success which has attended previous experiments of this nature.

Pending the receipt of the Board of Trade's sanction to the running of trailer and coupled cars, the L.C.C. Tramways Department is obtaining estimates for 150 trailer cars, and overhead equipment with couplers of about 200 of the existing cars. It is understood that the new trailer cars will be of a different pattern to those now in use, which consist of old horse-car bodies mounted on ordinary electric-car trucks.

It is announced that the Pennsylvania Railway is to use single-phase motor-cars on its suburban division from Philadelphia to Paoli, and that the Chicago, Milwaukee and St. Paul Railway will use 2,400-volt direct-current on the 440 miles of track in Dakota and Montana.

Mr. C. W. Mallins, General Manager of the Liverpool Corporation Tramways, has prepared an important report, in which he suggests the running of tramcars under the River Mersey between Birkenhead and Wallasey, in conjunction with municipal authorities in the eastern towns.

The Wolverhampton Corporation employees have, it is reported, asked permission of their union to take a ballot as to striking unless the Corporation agrees to cover in the ends of all tramcars, among other demands.

The capital of the British Columbia Electric Railway Co. is to be increased by £400,000.

A satisfactory trial has been run with a double-decked trolley-bus in Brighton.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The trawler owners of Hull, with the exception of one company, have decided to equip their fleets with wireless. For each fleet one trawler will act as a "mark" boat and remain stationary. Through it the messages will be transmitted to and from the Admiral trawler of the fleet. By this means the trawlers will be directed to the ports where the best market prevails.

The lattice mast for supporting the Goldschmidt aerial at the new wireless station at Tuckerton, New Jersey, is now complete. The tower, which is insulated on glass pillars, is 825 ft. high and has a hemi-spherical base which is free to move in a massive socket. It is made up of two sections hinged 480 ft. from the ground by a similar joint. It is kept vertical by twelve steel cables, each anchored in 1,100 tons of concrete. According to the *Standard*, similar stations are to be erected on the Pacific Coast of the United States, in the Pacific Islands, and in Asia.

A special meeting of the Hull Corporation was held on Monday to discuss the recommendation of the Telephone Committee, given on p. 685 of our issue for December 11th, that the telephone system in Hull purchased by the Post Office from the National Telephone Co. should be taken over by the Corporation at a price of £192,423, the Corporation being granted a new licence for twenty-one years as from January 1st, 1914. The purchase was agreed to.

Censorship has been established at Guayaquil on all messages to places in Ecuador excepting St. Elena.—The Tenedos-Lemnos cable was restored on the 6th inst.—The *c.s. Mackay-Bennett* had a collision off Gravesend, but proceeded on her way, although the other vessel had to be beached.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 27. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**ELECTRIC HEATERS.**—A new illustrated catalogue of electric heaters has been issued by the British Prometheus Co., Ltd. (9 Newman Street, Oxford Street, W.). This includes many artistic designs of both lamp radiators, and the company's special form of convectors, fitted with their open or armoured type elements of non-oxidisable metal films deposited on mica. A very large number of patterns are included, from simple electric heaters for business premises, to beautiful productions harmonising with the most refined styles of decoration.

**CABLES AND SUPPLIES.**—One of a series of leaflets issued by the Electrical Supplies Co. (41 Cheapside, E.C.) deals with wires, and contains net prices of a wide range of different qualities. Thus, for example, the prices of 3/22 cable per mile vary in nine steps from £9 to £23 6s. Other lists deal with Ferranti electric fires in a number of designs, Ferranti ovens and breakfast cookers.

**OZONAIR FOR MEDICAL PURPOSES.**—A new pamphlet, entitled, "Ozonair Apparatus for Therapeutical Applications," has been issued by Ozonair, Ltd. (96 Victoria Street, S.W.). After describing the valuable therapeutic value of pure ozone, a description of the well known Ozonair apparatus is given, followed by some extracts from the reports of medical men on the use of ozone for the treatment of different diseases.

**POTENTIOMETERS.**—A recently issued list by Crompton & Co., Ltd. (Chelmsford, Essex), deals in detail with the principles, construction, and use of the Crompton Potentiometer. This celebrated piece of apparatus as now made may be used for accurate measurements of various quantities, including resistance, the power absorbed by a motor, the efficiency of a pair of similar machines, the pressures on the two sides of a three-wire distribution system, as well as for instrument calibration, &c. The mirror galvanometer used has a moving coil with 100, 300, or 1,000 turns, and the sensitiveness of the instrument, when adjusted to give a complete period of oscillation of from 6 to 8 seconds, is approximately 1.1, 1.4, and 0.4 mm. deflection of the beam of light on a scale one metre distant for a P.D. across the instrument of one micro-volt. For one micro-ampere the deflections under the same conditions are 20, 56, and 160 mm. respectively.

### CHRISTMAS SOUVENIRS, &c.

The Jandus Arc Lamp & Electric Co., Ltd., are distributing to their friends a calendar bearing a fine coloured reproduction of an original crayon drawing prepared specially for them by Mr. C. E. Ritchie, of which they hold the copyright. They state that there will be no reprints of the picture beyond the limited number already prepared.

A very convenient-shaped narrow, thin pocket memorandum book accompanies the good wishes of Chas. H. Blume, varnish manufacturer, Sheffield.

We have received a neatly executed calendar from the Submarine Signal Co., which is made all the more interesting by the illustrations of vessels on which their submarine bell signalling system is employed.

The calendar of the United States Metallic Packing Co. is always attractive, and this year bears an embossed representation of Canova's statue at Hebe.

A very practical office calendar is that of Nalder Bros. & Thompson, who, in sending us a copy, inform us that they are shortly moving into much larger works at 97A Dalston Lane, N.E.

A neat little leather card-case has reached us from the Union Electric Co., Ltd.

### CRYSTAL GLASS FITTINGS

At the present time there is such great diversity in the schemes of decoration made use of, including the best of the old and historic modes as well as novel ideas of varying beauty, and the maker of electric light fittings has to enter into all these and to be able to supply numerous examples of his wares to accord with any style. The General Electric Co. (67 Queen Victoria Street, E.C.) have addressed themselves to this task assiduously, and a particular instance of their activities in this direction is afforded by the

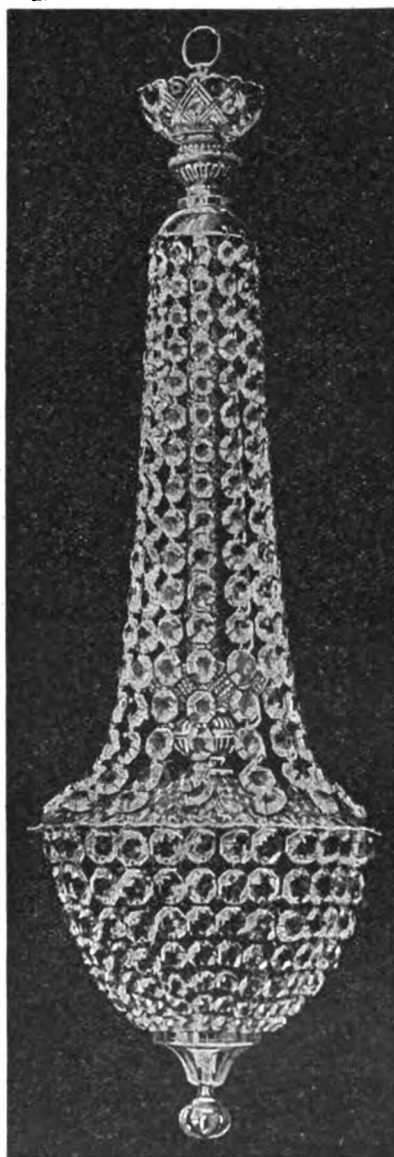


FIG. 1.—CRYSTAL FOUR-LIGHT ELECTROLIER.

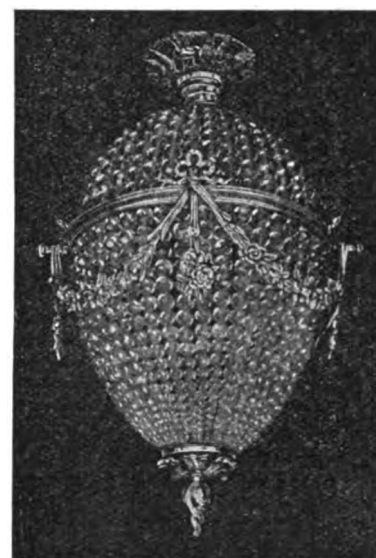


FIG. 2.—ORMULU MOUNTED CEILING FITTING.



FIG. 3.—GLASS CEILING FITTING.

fine new illustrated catalogue exclusively devoted to fittings in crystal glass which we have just received. A few of the fittings are illustrated here, and their variety is such that it is useless to attempt to particularise. The catalogue is admirably produced, and gives an excellent idea of the beauty of this series of fittings. Crystal glass fittings have a brilliancy and sparkle of their own which makes them harmonise well with rich and lavish schemes of decoration, and remind us of the styles in vogue in the France of the

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HIGHEST QUALITY  
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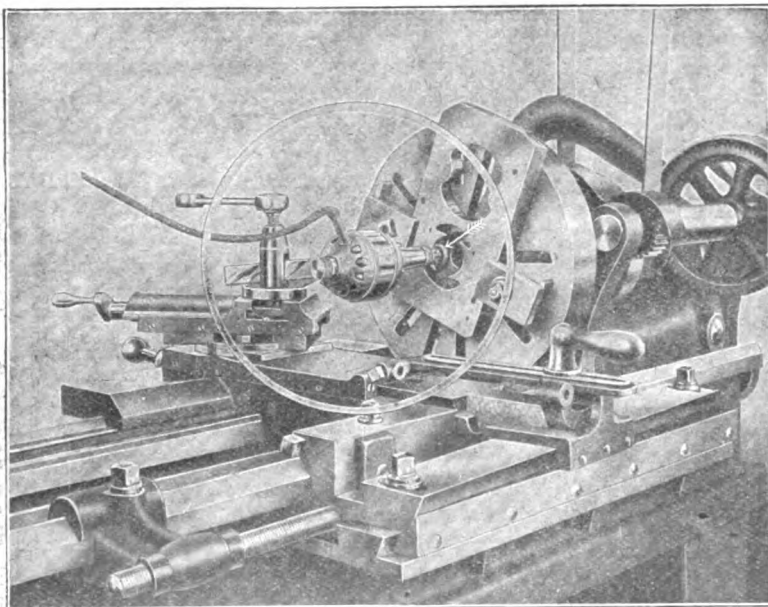
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SEGMENTS**  
THE MICANITE & INSULATORS CO. LD.  
OFFICES AND WORKS—  
WALTHAMSTOW, LONDON, E.

**F. WIGGINS & SONS,**  
FOR  
**MICA INSULATION**  
102, 103 & 104, MINORIES, LONDON.

Bourbons and of the glories of Versailles. Their modern applications are particularly the embellishment of dancing rooms, halls, restaurants and theatres, where a bright general illumination is required. The variety listed ranges from quite simple, inexpensive fittings to the most elaborate, and in most cases a few spare crystals or drops are included. We understand from the Company that no general distribution is to be made of this catalogue, but they will be pleased to forward a copy to those interested if they will apply to the Head Office at 67 Queen Victoria Street, E.C., or any of the provincial branches.

### A HANDY ELECTRIC GRINDER

A NEAT portable grinder, weighing only 5½ lb., which has been developed after careful experiments and tests by the Hamilton-Beach Manufacturing Co., of Wisconsin, has been put on the market in this country by H. W. Butler & Co. (Craven House, Kingsway, W.C.). The 4-pole series-wound driving motor is laminated throughout, and drives the wheel direct at about 10,000 r.p.m. It is rated at 1/12 h.p., and the set is furnished complete with strong flexible cord and plug, so that it can be attached to any electric light socket. Owing to its construction the same motor may be used on either direct or alternating current circuits, so that only the voltage has to be stated when ordering. The armature shaft is ground on centres to a mirror finish, and the motor is well ventilated so as not to become excessively hot on overloads. The adjustable end thrust and bearing provided take up all wear and play. The bearing caps are



PORTABLE GRINDER ATTACHED TO SLIDE REST.

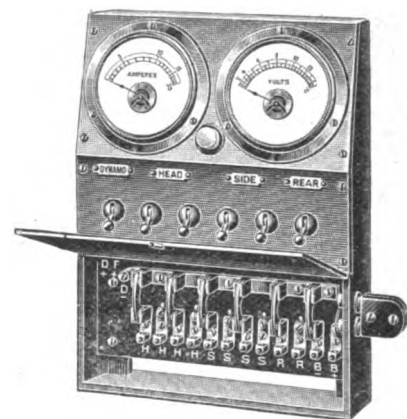
dust-proof, so that grit and dirt cannot enter. The illustration shows the grinder in use in the ordinary lathe slide-rest doing some difficult internal grinding (a 1½-in. hole 4 in. deep can be ground out), though there are many other purposes for which it can be used, including the grinding out of small holes if carborundum or emery pencils are attached.

### A NEW IGNITION BATTERY

A N ignition battery with a novel feature is being introduced into this country under the name of the "Varta" battery, by G. Braulik (8 Lambeth Hill, Queen Victoria Street, E.C.). These cells are sent out from the German works of "Varta" Accumulatoren G.m.b.H. with the plates in a charged condition, but unfilled with acid. When sold to customers they only need filling with chemically pure sulphuric acid, and they are then ready for use. At the first discharge in this way some 80 to 90 per cent. of the full capacity can be obtained. If desired the batteries can be kept unfilled as a reserve and filled up just when required for use, as for example, when a battery in use has unexpectedly given out. They can be stored for practically any length of time in an unfilled condition so long as kept in a dry place. The "Varta" battery is constructed with pasted plates with cakes of active material. The plates are rigidly mounted in a celluloid box with ebonite separators, and have substantial lugs. The outer cases can be of sheet-iron or wood.

### AUTOMOBILE LIGHTING SWITCHBOARDS

WE have received particulars from A. P. Lundberg & Sons (477 to 489 Liverpool Road, N.) of two standard forms of switchboard for automobile lighting circuits which they have recently introduced. These are very compact, and the row of six switches, the fuses and an ammeter and voltmeter are arranged in a case no more than six inches wide. One form has a fuse in the battery circuit only, and the other, which is illustrated here and has a slightly higher bottom compartment, is



AUTOMOBILE LIGHTING BOARD  
WITH FUSES ON ALL CIRCUITS.

provided with fuses for each lighting circuit. The cases can be either of mahogany or aluminium, or a brass front can be fitted if desired. On one side there is a plug connection for a movable hand-lamp, and a push-button is provided in connection with the voltmeter. The firm has also introduced some useful patterns of plugs for automobile lighting circuits. One of the designs is provided with a non-detachable screwed ring for securing the plug to the socket, and can also be fitted with the lamp-holder pattern of cord grip.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Belfast.**—An expenditure of about £15,000 is contemplated in 1914-15 upon mains extensions, services, meters, &c.

A supply of cables is required by the Belfast Harbour Commissioners. Secretary, January 28th.

**Bradford.**—One 5,000-kw. live steam turbo-generator. City Electrical Engineer, January 22nd. (See advertisement on another page.)

**Brentwood.**—The Asylum Authorities require a petrol-driven electric lighting plant capable of dealing with 50 lights at the Harold Wood Asylum.

**Ipswich.**—Generating plant, rotary-converter, voltage-regulator, booster, cable connections, switchboard and switchgear are required. Borough Electrical Engineer, January 31st.

**New Zealand.**—The Feilding Borough Council invites tenders for two Diesel-engine-driven generating sets, switchboard, &c., for 2,400-volt single-phase 50-cycles. Further particulars at 73 Basinghall Street, E.C.

**Rotherham.**—The Borough Electrical Engineer recommends additional generating plant and buildings at a cost of £15,956.

**Rhyl.**—Extensions of power station. Borough Electrical Engineer, January 14th.

**Salford.**—Three-phase extra high-pressure and medium-pressure switchgear; also transformers. Borough Electrical Engineer, January 12th.

**Turkey.**—The Trebizond municipality invites offers by March 14th for a forty years' concession for electric lighting. An English translation of the conditions may be seen at 73 Basinghall Street, E.C.

**York.**—In consequence of the considerable demand upon the mains, the City Electrical Engineer has reported that additions will have to be made very shortly. He is giving this consideration, and is to submit a scheme.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Batley.**—School at Healey Lane.

**Canterbury.**—Additions to Kent County Lunatic Asylum. Architect, W. J. Jennings, 4 St. Margaret's Street.

**Grantham.**—Additions to isolation hospital.

**Guildford.**—New municipal offices.

**Longton.**—Cinematograph theatre. Architects, Nagington & Shellan, 35 Dale Street, Liverpool.

**Mountain Ash.**—New bank for Metropolitan Bank of England and Wales. Architect, T. W. Millar.

**Nelson.**—Improvements scheme, including erection of arcade, shops, billiard halls, &c.

**Northampton.**—Public baths scheme (£16,800).

**Reading.**—Cinematograph theatre, London Road. Architect, W. J. Hodgson, The Avenue, Camberley.

**Thirsk.**—Additions to hospital (£1,000).

**Warrington.**—New school at Oakwood Avenue.

**Worcester.**—New premises for Messrs. J. F. Willis, boot manufacturers.

**Worthing.**—New school (£8,000).

### Miscellaneous

**Accrington.**—Tenders are invited for three single-deck and two double-deck radial truck tramcars.

**Australia.**—Five 1,000-kw. rotary-converters, fifteen 865-kw. single-phase transformers, &c., for N.S.W. Government Railways and Tramways Department. Further particulars at 73 Basinghall Street, E.C.

**Canada.**—The Canadian Department of Public Works requires about 20,260 yds. of 4-core gutta-percha telegraph cable, and 28,370 yds. of 2-core gutta-percha telegraph cable, by May 1st. Further particulars at 73 Basinghall Street, E.C.

**Plymouth.**—A twelve-months' supply of arc-lamp carbons, meters, transformers, cables, &c. Borough Electrical Engineer, January 19th.

**Russia.**—Permission has been given to the St. Petersburg Municipal Authority to purchase electric tramcars from abroad.

**South Shields.**—An expenditure of £17,260 is contemplated on tramway extensions.

## TENDERS RECEIVED AND ACCEPTED

**Bath.**—A contract for a twelve months' supply of D.C. meters has been placed with Messrs. Chamberlain & Hookham.

**Bedford.**—The Corporation has decided to accept the lowest tender for a turbo-alternator at £5,938. As stated on page 723 of our issue for December 18th, 1913, twenty tenders were received for this plant, but so far the names of the tenderers have not been made public.

**Dundee.**—The Council has given the Chairman of the Electricity Committee and the General Manager powers to purchase a 5,000 kw. turbo-alternator either by repeat order or otherwise as they think fit. The results in the reliability of the Willans & Robinson turbines have been favourably commented upon in connection with this action of the Council, but no definite instructions have been given, the matter being left entirely to the judgment of the Chairman and Mr. Richardson.

**London.**—The Edison & Swan United Electric Light Co. have received a contract for 1914 for the supply of Royal Ediswan lamps to the British India Steam Navigation Co.

## APPOINTMENTS AND PERSONAL NOTES

Among the New Year's Honours we notice that Professor E. Rutherford, F.R.S., and Mr. W. E. Garforth have been created Knights. The latter has done a considerable amount of work in connection with the prevention of explosions in coal mines. Sir C. A. Cripps, who has been made a Peer, is, of course, well known as having taken a distinguished part in many leading arbitrations in connection with the electrical industry, not the least important of which were those in connection with the acquisition of the National Telephone Co. by the State, and the selection of the system of traction on the Metropolitan and District Railways.

Mr. Cyril Clarke, Borough Electrical Engineer at Birkenhead, has now been appointed Tramway Manager. Mr. Clarke, who was appointed Borough Electrical Engineer in succession to Mr. W. Wyld, on the latter's appointment to Hampstead last year, has been discharging the Tramway Manager's duties temporarily hitherto.

The Earl of Lauderdale, who was Chairman of the Great Northern & City Railway Co. prior to its absorption by the Metropolitan Railway, has now joined the Board of the latter.

The salary of Mr. C. C. Atchison, Borough Electrical Engineer at Rochdale, has been increased from £450 to £500 per annum.

We regret to learn the death of Mr. W. W. Alston, Chief Assistant Electrical Engineer to the West Bromwich Corporation.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

**SWITCHBOARD TYPE  
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INSTRUMENTS.**

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3067 Victoria.  
Telegrams & Cablegrams:  
"Infusion,"  
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104 Altrincham.  
Telegrams & Cablegrams:  
"Infusion,"  
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HEATHMAN'S PLAIN  
DECORATOR'S TRESTLES.  
MADE IN TWO WIDTHS  
12'6" TOP TO TAKE ONE SCAFFOLD BOARD,  
17'6" TOP TO TAKE TWO SCAFFOLD BOARDS.  
"FOR SALE  
OR HIRE"

**Ladders, Steps,  
Trestles,  
Scaffolds, &c.**

Sale or Hire.

**HEATHMAN & CO.**  
10, Parson's Green,  
London, S.W.



## LOCAL NOTES

**Belfast: Street Lighting.**—The action of the Electricity Committee, in deferring for the present the electric lighting of North Street, created a little discussion at the last meeting of the Corporation, in view of the expression of opinion on the part of the police that this thoroughfare should receive similar treatment in the matter of electric lighting to the other important streets in the city. It appears that the Electricity Committee's action is due to the possibility of obtaining half-watt lamps in the very near future, and beyond urging that the lighting of North Street should receive favourable consideration, the Corporation did not give any definite instructions to the Electricity Committee.

**Birmingham: Explosion in Cable Inspection Box.**—Last Friday evening the lid of an inspection chamber at the corner of Station Street and Hurst Street was blown off, owing to an explosion which took place within. The immediate application of sand prevented a fire.

**Bolton: New Power Station.**—The turbines under construction by Messrs. Musgrave & Sons for the new power station have been reported to the Corporation as ready for inspection, and a deputation from the Electricity Committee is to visit Messrs. Musgrave's works for this purpose.

**Cheshire: Electric Supply Scheme.**—The Weaverham Electric Supply Co. has inaugurated a supply of electrical energy in a number of villages in the Weaverham district as an extension to the supply in Weaverham itself. The water of the River Weaver is made use of for generating purposes, and the scheme has been developed under the supervision of Mr. A. J. Leigh, Consulting Engineer. A special tariff has been evolved for cottages, and as an example the unlimited use of one light can be had for 3d. per week.

**Chorley: Electric Lighting.**—The Council and the Lancashire Electric Power Co. are in negotiation with regard to the latter applying for an electric lighting provisional order.

**Darfield: Electric Lighting.**—The Council and the Yorkshire Electric Power Company are negotiating with regard to a supply of electricity.

**Dundee: Supply Interruption on Christmas Eve.**—We have obtained particulars of a serious interruption in the supply in Dundee which occurred on Christmas Eve owing to a very unusual mishap. Owing to the non-delivery of plant due to increasing labour troubles in this country, all the existing plant was running at its full capacity just as dusk was coming on, when, unluckily, one of the B.T.-H. Co.'s employees, who was at work in connection with the extension of the high-tension switchgear, apparently had some slight accident which caused an arc from a high-tension bar, and made it necessary to shut down in order to stop the arc. The damage done to the switchboard was very slight, but the shut-down, which lasted for a quarter of an hour to thirty-six minutes in various districts, was, of course, serious. To be quite accurate, the pressure was not really entirely off the mains, as the old station at Dudhope was running, but could only keep the pressure up to about half the normal.

**Eastbourne: Supply Interruption.**—Mr. J. K. Brydges, the Borough Electrical Engineer, reported at the meeting of the Corporation on Monday, with regard to the recent interruption in the supply, in the terms of the account given on page 14 of our last issue. The Corporation passed a vote of confidence in the staff on the manner in which they worked to overcome the difficulty, and the suggestion was made that some system of sectionalising the mains would prevent any such occurrence in the future. This matter is now receiving the attention of the Borough Electrical Engineer and the Committee.

**Hove: Purchase Price of Company's Undertaking.**—According to the *Sussex Daily News*, the Corporation has agreed with

the Hove Electric Lighting Co. to pay a figure of between £175,000 and £176,000 for the company's undertaking. In coming to this agreement the Corporation has been advised by Messrs. Handcock & Dykes, who also recommend an expenditure of a further £20,000 in modernising the plant. This latter includes 600 kw. Diesel-engine-driven generating sets, bringing the total plant capacity up to 2,700 kw. Even now, however, the Corporation has come to no decision as to whether it will work the undertaking itself or not, and the carrying out of the extension works will no doubt depend on this decision.

**London: Islington: Workhouse Lighting.**—A L.G.B. inquiry was held at the offices of the Guardians last week with regard to a decision of the Board to instal electricity in place of gas in several of its institutions. The inquiry was the result of a protest on the part of eleven members of the Guardians against the use of electricity. The inquiry was private, and neither the Borough Electrical Engineer nor the representative of the Gas Light & Coke Company were allowed to be present.

**Peterborough: Large Power Contract.**—The Electricity Committee had entered into a contract for the supply of electrical energy to a large factory at a flat rate of 0.9d. per unit, the minimum consumption being 75,000 units, although the firm stated that the probable consumption will be between 175,000 and 200,000 units per annum. When the matter came before the last meeting of the Corporation, the expenditure of £1,888 upon mains involved in this contract was the subject of a good deal of comment and some opposition, and in the absence of the Chairman of the Lighting Committee the matter was referred back. It was explained, incidentally, that the mains involved in this large contract would also be available for supplying other consumers on the line of route.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5, Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £67 to £67 10s. (last week, £68 5s. to £68 15s.).

**The Electrical Supplies Co.**—Mr. E. C. Beman (late of the Edison Swan Co. and the Brush Co.) and Mr. F. J. Allen (late of the Brush Co.) have commenced business at 41 Cheapside under the above style as wholesale factors of electrical apparatus of every description.

**Change of Address.**—Nalder Brothers & Thompson, Ltd., who, as announced on another page, will shortly be moving to a new works at 97A Dalston Lane, N.E., ask that for the next two or three weeks, till they are in full working order there, correspondence should still be addressed to 34 Queen Street, E.C.

**New Telephone Number.**—Messrs. Morris & Lister (3 and 4 Palace Chambers, Westminster, S.W.) inform us that their telephone number is now Victoria 7844.

**Oliver-Pell Lamp.**—The advertisement on page iii. of our last issue relating to the new Oliver-Pell Flame Arc Lamp was inserted owing to an error on our part, as Oliver Arc Lamp, Ltd., is not yet quite ready to supply the Oliver-Pell (120 to 150-hour) lamp, which is to supersede the "Oriflamme" at an early date. When the lamp is ready for the market we hope to publish a description of it and its advantages in our columns.

**Ediswan Motor Service.**—A card from the Edison & Swan United Electric Light Co. calls attention to the large fleet of motor-vans which they employ between the Ponders End works and other parts of the metropolitan area, and bears an effective illustration of a procession of these vans.

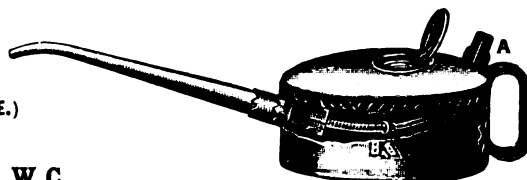
## KAYE'S LATEST PATENT SERRATED STEEL SEAMLESS OIL CAN

Sole Makers

**JOSH. KAYE & SONS LTD.**

(Managing Director: W. K. KAYE, M.I.Mech.E.)

Lock Works, LEEDS,  
And 93, High Holborn, London, W.C.



FITTED WITH

A New Patent Thumb Button and Patent Seamless Spout.

Also in Copper or Brass for Electrical Purposes.

Contractors to H.M. Navy, War Department, Home Office, and Indian State Railways.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 368 [VOL. X., No. 3]  
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THURSDAY, JANUARY 15, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday First post

Small Advertisements and Official Announcements, Wednesday First post.

Displayed Advertisements, Tuesday First post.

Corrections in Standing Advertisements, Monday First post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Oireling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE "half-watt" lamp is now on the market in sizes of 600, 1,000, 2,000, and 3,000 c.p. The smallest size is made only for voltages between 50 and 65; the 1000 c.p. size for 50-65 and 100-130 volts; and the 2,000 and 3,000 c.p. lamps for voltages from 100 to 130, and 200 to 250. One maker also manufactures these larger sizes for 50 to 65 volts. Descriptions of the lamps, a review of the course of research which led to its development, the reasons which prevent its being made for small candle-powers at present, a consideration of the question of series connection, and the views of central station engineers all over the country on the prospects of the lamp in their districts, will be found in articles on pages 31 to 33, and 37 to 39.

A LETTER from an "Indignant Britisher" asks why England was three months behind Germany in placing the half-watt lamp on the market.—Mr. W. P. Durnall writes to the effect that though there may be isolated cases in which the electrical control of guns on warships has proved not to be perfect, yet there is no necessity to replace all electrical gears by hydraulic gears. (Page 34.)

To facilitate the comparison of tests of conductor rails, a collection of suitable test sheets has been published.—The scheme for running tramways under the Mersey is being considered by a Committee of the Liverpool Corporation. (Page 34.)

THE Portsmouth Corporation has decided to transfer its telephone undertaking to the Post Office for £35,000.—The Post Office has acquired the Inns of Court Hotel,

**BINDING "ELECTRICAL ENGINEERING."**—Vol. IX. of "Electrical Engineering" (Jan.—Dec. 1913) closed with our issue of December 25th, 1913. Readers can have their volumes bound by their own bookbinder; or, they may send their numbers to THE KILOWATT PUBLISHING CO., LTD., Temple Chambers, London, E.C., carriage paid (with the reader's name and address), and a remittance of 4s. 6d. under separate cover. The volumes will then be bound and returned carriage paid to any address in the United Kingdom, or carriage forward to the Colonies or abroad. Binding Cases (including index, but not including binding) 2s. each, or post free 2s. 4d. (Abroad 2s. 6d.) Index alone, 1d. (Post free 2d.)

Holborn, for the purpose of a telephone exchange. (Page 34.)

In a Paper read before the Institution of Electrical Engineers, Mr. B. Welbourn mentioned that there are over 1,000 miles of overhead high-tension transmission lines in the United Kingdom. He reviewed the various questions arising in their construction, and in the course of his Paper suggested that the Merz-Hunter split conductor system of protection rendered guard wires unnecessary, and also mentioned that Messrs. Merz & McLellan had discarded lightning arresters, and, instead of using them, increased the insulation on the end windings of the step-up and step-down transformers by 300 to 400 per cent. Mr. Welbourn also advocated the initial construction of lines for double the voltage for which they were intended, in view of a general increase in transmission pressures becoming expedient. In the course of the discussion the menace of H.T. overhead wires to air-craft was mentioned. (Page 35.)

THE regulation of the pressure of A.C. circuits, fed by alternators with different characteristics, by means of a single regulator, is dealt with in our "Questions and Answers" columns. (Page 36.)

MAINS extensions are required at Dorking (£2,000); Dublin (15,000); Hackney; Monmouth (£1,800); Napier (N.Z.) (£2,500); and Walsall (£600).—A scheme of extensions costing some £50,000 has been prepared at St. Pancras; the Lytham Council has decided to proceed with its lighting scheme (£23,700); new plant is required at Shipley (£27,000), and Wakefield (£18,000).—Stores are required at Marylebone, Cheltenham, and Belfast. (Page 40.)

THE Patent Specifications published last week include one for the pressure regulation of rotary converters by Siemens Bros. Dynamo Works, and J. C. Wilson. Another specification by Siemens Bros. Dynamo Works relates to the pressure regulation of A.C. circuits by the use of an auxiliary transformer and induction regulator. Two specifications by the B.T.H. Co. relate to the drawing of tungsten wires and to the use of cryolite for preventing bulb blackening in incandescent lamps, while one by H. Zschockf describes a method of mounting filaments using glass or porcelain spider arms. (Page 41.)

ERSOM has the honour of being the first town in this country to have a street lighted with half-watt lamps.



An illustration of this taken at night appears on page 42.

LONDON municipal engineers are unfavourably disposed towards any proposal to supply London in "bulk" from large power stations in the hands of companies.—A proposal that the Monmouth electricity undertaking should be sold has been rejected by an overwhelming majority.—A town's meeting is to be held at Redditch to consider a suggestion that the electricity undertaking should be handed over to a company.—The Carnarvon Council is inclined not to enter into any further "free wiring" agreements. (Page 42.)

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members at the meeting on Thursday:—*Member:* R. Hersfeld. *Associate Members:* J. Denham, A. B. Eason, S. Evans, A. M. Field, W. J. Oswald, C. T. Pressland, J. P. Tivey, C. F. Wade. *Associate:* E. McKenzie. *Graduates:* F. Carr, H. Fasnacht, F. B. Joseph, A. J. Mavor, J. Morgan, F. C. Platt, F. A. Simpson, A. E. Smith. *Students:* H. G. Baker, R. A. Bottone, T. S. Brunton, R. R. Dawes, L. H. Field, W. J. Jones, A. W. Langridge, F. H. Mann, J. E. Odgear, B. Paul, P. Singh, F. K. Skevington, C. C. Sleigh, H. C. Vereker, P. Ward.

*Candidates Transferred—Associate Member to Member:* C. L. Cartwright, F. R. Marsh, J. M. Maxwell, E. E. Moore. *Associate to Member:* W. H. Ashman, A. F. Richards. *Graduate to Associate Member:* T. S. Mann. *Associate to Graduate:* O. C. Waygood. *Student to Associate Member:* J. O. Archer, F. A. Broadhurst, G. A. Hollings, C. G. Le Feuvre, J. A. Manners-Smith, C. A. Martin, H. T. Nadejde, H. Papazian, T. F. Potts, A. K. Roxburgh, J. A. Taylor, J. L. Thompson. *Student to Graduate:* L. J. Brennan, R. Gray, K. C. Mittra, W. C. Tisch, S. Wilkinson, E. Wyatt.

**Electrical Trades Benevolent Institution.**—A leaflet has been issued by the Electrical Trades Benevolent Institution, in which is set forth the necessary qualifications for membership and the advantages. The two chief of these are provision by the member for himself against the possibility of being in a destitute position, and help for those who have had the misfortune to arrive in that position. Members may also insure their lives on very favourable terms. The minimum subscription of members is 10s. per annum. Full particulars may be obtained from the Secretary, Mr. F. B. O. Hawes, of 18 Park Mansions, South Lambeth Road, S.W.

## ARRANGEMENTS FOR THE WEEK

FRIDAY, JANUARY 16TH.

*Manchester Electro-Harmonic Society.*  
7.30 p.m. Concert at Albion Hotel.

MONDAY, JANUARY 19TH.

*Institution of Electrical Engineers: Western Section.*  
5.30 p.m. At Bristol University. "The Employment of Power in H.M. Post Office," by H. C. Gunton.

TUESDAY, JANUARY 20TH.

*Institution of Post Office Electrical Engineers.*  
6 p.m. At Institution of Electrical Engineers. "Overhead Wire Construction for Medium and Low Pressures," by A. P. Trotter.

*Institution of Electrical Engineers: Manchester Students' Section.*  
7.30 p.m. At Municipal School of Technology. "Electrotherapeutics," by S. D. Anderson.

WEDNESDAY, JANUARY 21ST.

*B.E.A.M.A.*  
7 for 7.30 p.m. Annual Dinner at Savoy Hotel.  
*Wireless Society of London.*  
8 p.m. At Institution of Electrical Engineers. Address by President, Mr. A. A. Campbell Swinton.

THURSDAY, JANUARY 22ND.

*Institution of Electrical Engineers.*  
8 p.m. Fifth Kelvin Lecture by Sir Oliver Lodge, F.R.S.

FRIDAY, JANUARY 23RD.

*Physical Society.*  
5 p.m. At Imperial College of Science. The Agenda includes an Exhibition of a Water Model of the Musical Arc by W. Duddell, F.R.S.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, JANUARY 15TH.—*C. Company.* Technical Instruction, 7 to 10 p.m.

FRIDAY, DECEMBER 16TH.—*D. Company.* Special Class on Crossley Engine and Technical Instruction, 7 to 9.30 p.m.

SATURDAY, DECEMBER 17TH.—*Headquarters open from 10 a.m. till 12 noon.*

MONDAY, JANUARY 19TH.—*A. Company.* Technical Instruction, 7 to 10 p.m.

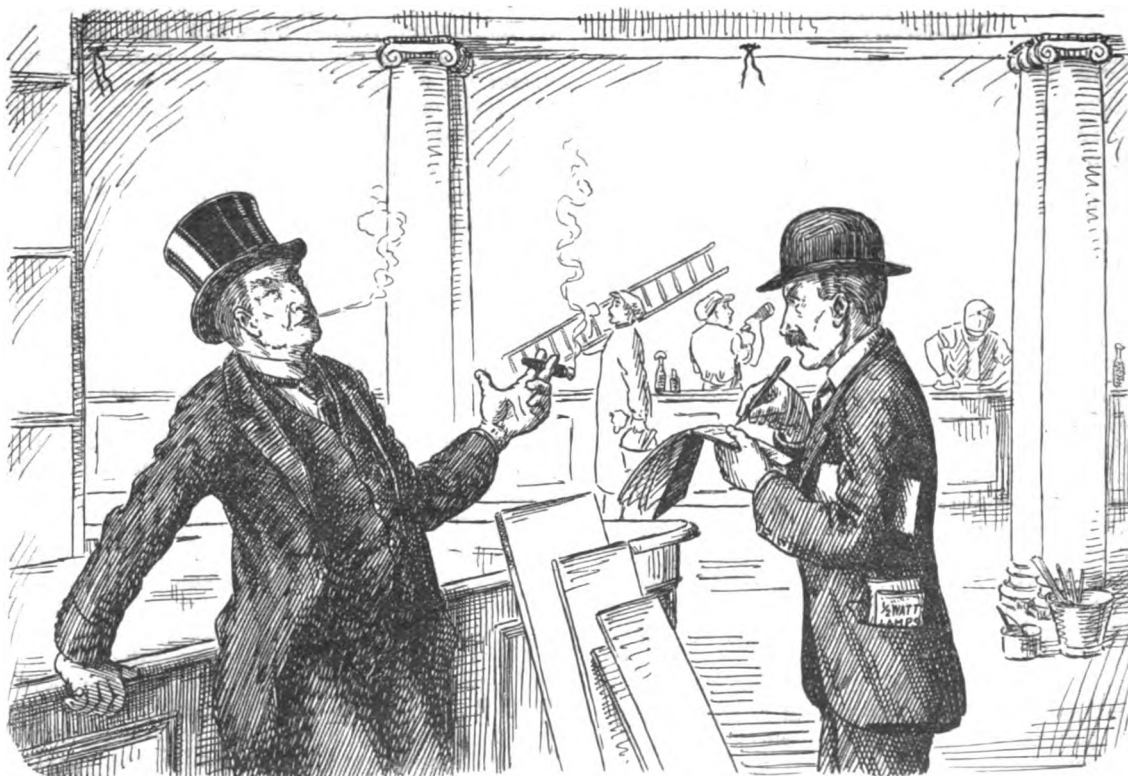
TUESDAY, JANUARY 20TH.—*B. Company.* Technical Instruction, 7 to 10 p.m.

WEDNESDAY, JANUARY 21ST.—*Recruits only.* Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, JANUARY 22ND.—*C. Company.* Technical Instruction, 7 to 10 p.m.

FRIDAY, JANUARY 23RD.—*D. Company.* Technical Instruction, 7.30 to 9.30 p.m.

SATURDAY, JANUARY 24TH.—*Headquarters open from 10 a.m. till noon.*



WHAT'S IN A NAME?

**CUSTOMER (To Contractor).**—This shop is a good bit bigger than the others, and I want some really fine lighting. You had better put in whole-watt lamps here.

### THE HALF-WATT LAMP

ON Monday last the "half-watt lamp" was placed on the market in this country simultaneously by six firms of lamp manufacturers, whose names appear elsewhere in this issue. The sizes, voltages, and prices are as follows:—

300 WATTS (*approximately 600 British candle-power*).—50 to 65 volts. £1 10s. each.

500 WATTS (*approximately 1,000 British candle-power*).—50 to 65 volts, and 100 to 130 volts. £1 15s. each.

1,000 WATTS (*approximately 2,000 British candle-power*).—100 to 130 volts, and 200 to 250 volts. £2 10s. each.

1,500 WATTS (*approximately 3,000 British candle-power*).—100 to 130 volts, and 200 to 250 volts. £3 each.

The lamp is the outcome of a discovery made by Dr. W. R. Whitney, of Schenectady, after a long series of researches, that the blackening of the bulbs of tungsten lamps run at a high temperature is enormously diminished if nitrogen is introduced in the bulb, so that the filament glows in an atmosphere of nitrogen instead of in a vacuum. The importance of this is at once apparent from the fact that a tungsten filament, at a temperature just below the melting-point of the metal, would have an efficiency of 0.2 watt per c.p., whereas it is not found expedient to run ordinary tungsten lamps at a higher efficiency than between 1 and 1½ watts per c.p. Unfortunately, however, another phenomenon comes in, namely, that the presence of gas in the bulb has a cooling effect on the filament owing to the currents of heated gas rising from the hot filament, so that a certain amount of extra energy has to be given to the filament to compensate for the heat given off in this way. With filaments of large diameter, the additional energy required is not so great as to prevent a much better efficiency being obtained with the nitrogen-filled lamp, but the cooling effect of these convection currents is relatively much greater on a filament of small diameter. So marked is this contrary effect that, if an ordinary tungsten lamp were filled with nitrogen and then run so as to give the same light as a lamp of the same size with the filament in a vacuum, it would require more watts instead of less. This is roughly the reason why the present "half-watt" lamps can only be made in sizes of large candle-power.

To a considerable extent, however, the same result as giving the filament itself a large diameter can be arrived at by winding it in the form of a close helix, and this is the form of the filaments in the half-watt lamp as now developed. If the diameter of the helix is too great or the diameter of the filament too small, however, it will sag at the high temperature employed, as tungsten is soft at temperatures near its melting-point, and the turns of the helix would touch and short-circuit. Considerable further experimental research will therefore be necessary before lamps of low candle-power can be produced on this system.

The blackening of a tungsten lamp is partly due to two causes. One is simply evaporation of the tungsten itself, and the other is the presence of small quantities of water-vapour. The effect of the water-vapour is to attack the tungsten at its high temperature, producing a volatile oxide of tungsten and atomic hydrogen; the latter reduces the oxide, deposits metallic tungsten on the bulb, and combines with the oxygen again to form water-vapour, so that the process is cyclic. It is said, however, that in the best lamps the water-vapour present is extremely small, and that in them the blackening is entirely due to evaporation of the tungsten. The convection currents of the nitrogen gas which is introduced in the half-watt lamp carry the evaporated tungsten upwards, and it is deposited either on baffle plates, seen above the filaments in some of the makes of lamps, or in the neck of the bulb. This is one of the reasons why the necks of

the lamps are so long; another reason is that, owing to the convection currents, the upper part of the bulb would otherwise be liable to get too hot.

Readers who may desire to study further the extremely able course of research which has led to the evolution of the "half-watt" lamps, should refer to articles of a technical nature which appeared in *ELECTRICAL ENGINEERING* of October 9th and November 20th; they may also be interested in the light distribution curves published in our issue of January 1st. Further detailed information and particulars of a commercial nature will be found this week in our Trade Section and our advertisement pages. We also publish overleaf the opinions of central station engineers all over the country as to the applicability and prospects of the half-watt lamp in their districts, and of the situation generally.

### PROSPECTS OF THE HALF-WATT LAMP

HAVING in view the early advent of the "half-watt" lamp, we wrote last week to a number of supply station engineers all over the country to ascertain their views as to the prospects of the lamp in their districts. We give on the next two pages extracts from some of the replies received. It will be seen that the half-watt lamp is welcomed by practically all, and the demand for the new lamp is likely to be enormous. These letters show that in almost every town there is an immediate applicability of the lamp for outside shop lighting, while, on the other hand, the extent to which the prospects for street lighting with half-watt lamps are favourable, vary very much, owing chiefly to the different conditions in the various towns.

We have endeavoured on previous occasions to allay the "half-watt panic" among central station engineers, fostered, we regret to say, by some of our contemporaries. From the technical article which appears on this page, it will be evident that a 16-c.p. lamp or even one of 50-c.p., constructed on precisely the same lines as the 600- to 3,000-c.p. lamps described, would have a poorer and not a better efficiency than the existing 1½-watt metal filament lamps. That the difficulty will eventually be overcome is by no means improbable, but the knowledge already gained by the extremely clever and laborious research work will have to be largely augmented by further painstaking experiment in the laboratory before the goal is reached, and if a low candle-power half-watt lamp is produced within the next two or three years, it is bound to come in easy stages. When it does come, however, it will be the meter manufacturer and not the supply station manager who will enlist our sympathy, for, except to the larger houses, electric lighting will then obviously be supplied on a contract or "per lamp" system of charging.

Returning to the present situation, the question is sure to be asked by many central station engineers: Will it be worth while to use series connections for the 300- and 500-watt lamps, or will these sizes be soon available for 200-volt circuits? The answer is, use the lamps which are most suitable, and put up with the series wiring if necessary. The problem is not the same as with the 1½-watt tungsten lamp, for the candle-powers are so much greater, and the number of lamps involved in each installation so much less, that the amount of series wiring required as a temporary expedient would not be formidable.

In conclusion, we would warn our readers that the effect of the half-watt lamp upon the gas companies will be to stimulate their competition for the heating and cooking load, and, after this digression, we return to the immediate question of the prospects of the half-watt lamp in the various towns of the United Kingdom,

and quote the views of the supply station engineers in different parts of the country.

#### LONDON.

**Mr. J. S. HIGHFIELD** (Metropolitan Electric Supply Co.): The lamps give a most beautiful light, and I should imagine that a number of shopkeepers and others, desiring a specially powerful light, would use them. They may also replace arc lamps for street lighting purposes, but of course it all depends on whether the life is reasonably long and the price sufficiently low.

**Mr. C. P. SPARKS** (County of London Electric Supply Co.): My personal opinion is that all improvements of this kind are to be welcomed, as they open up new lines of business.

**Mr. H. W. KINGSTON** (Charing Cross, West End, and City Electricity Supply Co.): As a rule it takes many years for this type of lamp to develop into a low-priced, low c.p. commodity, but if this were an exception to the rule it would undoubtedly influence our revenue. Assuming the development to be slow, I am of the opinion that it will be of considerable advantage to this Company and the industry as a whole.

**Mr. G. W. PARTRIDGE** (London Electric Supply Corporation): This half-watt lamp will be a great thing to the companies supplying alternating current where street lighting is contemplated.

**Mr. A. H. SEABROOK** (St. Marylebone): The immediate benefit to be obtained is in the direction of assisting competition with high-pressure gas, especially for outside shop lighting. Many supply undertakings run a flame arc lamp hire and maintenance scheme for this purpose, and any improvement that cuts out the necessity for skilled attendance is to be heartily welcomed. Comparing the arc and the half-watt lamp we are going to use more of our own product, i.e., electricity, and pay less in wages and carbons.

**Mr. W. C. P. TAPPER** (Stepney): So long as they are put on the market in very large candle-powers only, I think they will be welcomed by all central station engineers, as such lamps will form a very useful substitute for arc lamps, particularly for street lighting. If, however, the makers are contemplating the manufacture of these lamps in smaller sizes, the development should be spread over a sufficient time to enable the industry to adjust itself to possible new conditions.

**Mr. W. WYLD** (Hampstead): Owing to their large sizes, their use for some time will be restricted to the lighting of main streets and large areas. The majority of our 2,500 public lanterns are equipped with two 40-watt, and in some cases, two 80-watt lamps. Anything which tends to cheapen electric lighting and therefore strengthen us in the competition with gas, is to be welcomed, but perhaps it is well that these highly efficient lamps have come to us in stages of such length that we have been able very nearly to recover from the reduction of current and revenue before the next lamp has been brought out.

**J. H. BOWDEN** (Poplar): In this area the whole of the original open type arc lamps have been converted to high c.p. incandescent, excepting in three main thoroughfares, where 87 flame arc lamps have been installed, so that there is the prospect of doubling the light without increasing the cost, provided the price of the lamps in each instance remains constant. I am looking forward to the advent of this lamp as a means of introducing indirect lighting into offices and public buildings; the efficiency of existing lamps renders the present cost for current prohibitive.

**Mr. A. GAY** (Islington): It is a very great pity that this lamp should have been boomed some twelve to eighteen months before it was obtainable, with the result that the competitive forms of lighting have been pushed to the fullest extent. In connection with the half-watt lamp we have lost quite a number of consumers, as business houses are not prepared to wait indefinitely, and even begin to doubt the truthfulness of the representative's statements.

**A. J. FULLER** (Fulham): I have always been an advocate of high c.p. metallic filament lamps for shop and street lighting purposes. The larger lamp, if it has a reasonable life, will enable us to double the c.p. in all our streets without affecting the cost.

**Mr. G. W. KEATS** (Woolwich): They will prove a most effective weapon against pressure gas, and generally tend towards improved lighting, as many of the arc lamps at present on the market, quite apart from the cost of trimming and cleaning, are excessively costly to maintain, and leave much to be desired with regard to steady burning. I am of opinion that the new lamps will eventually entirely replace them in the majority of the positions in which they are at present installed.

**MANCHESTER.**—**Mr. S. L. PEARCE** writes: There is a reasonable prospect of our using some of the new half-watt metal filament lamps, of large candle powers, in connection with certain street lighting extensions that we are carrying out within the next twelve months or so. It is also quite likely that these lamps may in some instances be preferred to flame arc lamps in connection with our outside shop front lighting scheme.

**GLASGOW.**—**Mr. W. W. LACKIE** writes: The lamp will be welcomed in the same way as the 14-watt lamp was welcomed, as it will enable us to compete more effectively with incan-

descent gas lighting. In the meantime, however, until we get a half-watt metal filament lamp taking less than 400 watts, the flame arc lamp taking less than a fifth of a watt per candle will hold the field for the lighting of the principal streets.

**SHEFFIELD.**—**Mr. S. E. FEDDEN** writes: I welcome any apparatus of improved efficiency, as I believe this is bound to have a good effect on the electric supply undertakings sooner or later. In the first place, large c.p. lamps should be useful for outside shop lighting, and should prove a useful weapon to the electrical undertakings to fight the high-pressure incandescent gas lamps. They will also doubtless be well suited for street lighting purposes.

**NEWCASTLE-ON-TYNE.**—**Mr. L. E. BUCKELL** thinks that the lamps will be of considerable use for shop front lighting, street lighting, and large open spaces, assuming that the life of the lamp is satisfactory. They will displace arcs owing to the saving in trimming and maintenance.

**DUNDEE.**—**Mr. H. RICHARDSON** writes: There is a wide field for half-watt lamps of the smaller sizes being used in shops, warehouses, workshops, &c., if the results are satisfactory. For street lighting, neither from a technical nor commercial point of view are they in the running with modern flame arc lamps, and it certainly would be impossible ever to convince the "man in the street" that they were anything like so good as the flame arcs.

**BELFAST.**—**Mr. T. W. BLOXAM** writes: In the absence of experience as to the life of the half-watt lamp, I cannot say how the total cost will compare with arc lighting. It would appear to be only slightly less. Double the number of points of distribution in the same area can, however, be got for the same money, and, further, those people who estimate the illuminating power of a high-pressure gas lamp by staring at the mantle, will have to give the palm to the new lamps after applying the same "test."

**CROYDON.**—**Mr. A. C. CRAMB** thinks that the whiteness of the light will probably make it suitable for large drapery and other stores, but says that the effect of the cost of the lamp, life of filament, &c., have still to be considered.

**WEST HAM.**—**Mr. J. W. BEAUCHAMP** writes: Unless the price falls to a much lower figure and the life is of the order of 2,000 hours, I do not think these high c.p. lamps will show any great economy over the one-watt pattern. For street lighting, in large areas the cost of production for such a good load factor supply is comparatively low. We are, however, looking forward very much to the trial of the new lamps as a means of fighting the high-pressure gas outside shops, although at present we have not been troubled very much with that competition, owing largely to the very low rates at which we are able to supply and maintain flame arc lamps.

**BRIGHTON.**—**Mr. J. CHRISTIE** thinks the new lamps will be admirably suited for certain classes of street and outside shop window lighting, and as the tendency is to increase the standard of lighting for these purposes, he believes that users will prefer the increased light to halving their bills.

**STOKE-ON-TRENT.**—**Mr. C. H. YEAMAN** says that potters in his district estimate factory lighting only at about 100 hours a year. A good deal has been done there, however, with arc lamps for outside shop window supply, supplied with current at a fixed rate per annum, and the half-watt lamp may replace some of these, which he would regret. Generally in this area he estimates that the half-watt lamp will have the same competition with high-pressure gas lighting, as the ordinary metal filament lamp has with low-pressure mantle gas lighting.

**BURY.**—**Mr. S. J. WATSON** writes: While I cannot go so far as to say that we should be better off without the improvement in efficiency, still I feel that for a time the general adoption of the half-watt lamp is bound to have a rather serious effect on the industry. The outcome of further investigation into the problem will undoubtedly result in the manufacture of lamps of small as well as of large size. We have recently passed through the rather difficult stage covered by the conversion of carbon to metal filament lamps, but very few undertakings found it necessary to increase the charge for lighting. The income per house per annum at the present time, where a charge of 3d. to 4d. per unit is made for domestic lighting, is so small that it appears extremely probable that a revision of the lighting tariffs will have to be made. Only one-fifth of the income of the Bury undertaking is derived from lighting, the remainder is from power. The increased efficiency of the new lamps will not, therefore, have such a serious result to us as in other districts of a purely residential character. I am profoundly thankful that it is quite impossible to effect any improvement which will reduce the consumption of a motor below the standard of 746 watts per h.p.

**IPSWICH.**—**Mr. F. ARTON** writes: It is a satisfactory feature that it appears at first in large units. It will put us in splendid position for fighting gas for outside shop lighting, and for getting all the street lighting into our hands. It gives the progressive manager another splendid weapon in militant publicity work, and may bring nearer the day of a real concerted effort in advertising work shared by undertakers and manufacturers alike.

**BARROW-IN-FURNESS.**—**Mr. H. R. BURNETT** thinks that the large majority of consumers will use the lamp for improving

the illumination of their premises, without altering their electricity bills, and that if the lamp proves reliable gas for outside shop lighting will cease to be a serious competitor. For street lighting the half-watt lamp will be the greatest boon; the increasing motor traffic calls for an increase in the standard of illumination in most towns, and few, he says, can afford flame arc lighting except for important thoroughfares.

**WOLVERHAMPTON.**—MR. S. T. ALLEN writes: It is quite possible that they will displace altogether the arc lamps for public lighting, for although their efficiency will not be as high as that of some of the modern flame arcs, their low maintenance cost and absolutely steady light will give them a very strong position. I propose to carry out some tests in the main streets here with these lamps immediately I can get hold of some.

**BIRKENHEAD.**—MR. G. P. SHALLCROSS sends us particulars of a scheme for hiring out high c.p. filament lamps for outside shop lighting, which he has had in use for about twelve months. The charges are extremely low. For instance, for three evenings a week from dusk to 8 p.m., one evening from dusk to 10 p.m., and one evening from dusk to 11 p.m., the charge is only £3 14s. per annum for a 400 c.p. lamp, £4 7s. 6d. for a 600 c.p. lamp, and £5 15s. for a 1,000 c.p. lamp, including wiring, fixing, current, and maintenance. In fixing these rates, he had in view the advent of the half-watt lamp.

**ABERDEEN.**—MR. J. A. BELL says that everything depends entirely upon the price and life of the lamps.

**CARLISLE.**—MR. F. W. PURSE says that in a city like Carlisle there should be a good opening for the half-watt lamp.

**LEICESTER.**—MR. T. R. SMITH is about to adopt the lamp for a test on one of the tramway routes, and adds that he will heartily welcome the day when the half-watt lamp replaces in toto the present one-watt lamp.

**BARNES.**—MR. C. S. DAVIDSON writes: When the metal filament lamp was first introduced, the factors and contractors reaped a rich harvest, whilst for the supply authorities there was a considerable period of depression which could have been counterbalanced to a large extent had they had the power to make a profit on the sale of lamps. Is not this the time for the I.M.E.A. or the supply authorities to demand (the system of proceeding cap in hand does not appeal to present-day legislators) an extension of powers which are so essential to the proper development of their undertakings?

**HARROGATE.**—MR. G. WILKINSON will give the lamps a trial for street lighting as soon as they are available. He hopes that the manufacturers will pay special attention to the growing practice of using incandescent lamps without lanterns for street lighting, and that they will provide a satisfactory copper lamp-holder to screw on to the ordinary nipples, and strong enough to maintain the lamp in position without damage during all weathers. [We fear Mr. Wilkinson's suggestion will not be adopted; owing to the large amount of heat developed in the neck of the lamp, weatherproof lanterns are deemed to be essential.]

**ST. HELENS.**—MR. E. M. HOLLINGSWORTH writes: I am very anxious to obtain a number of half-watt lamps of 1,000-c.p. for the purpose of street lighting. We have in St. Helens an inclusive charge for the supply and maintenance of the lamp and energy taken. The majority of the lamps in use at the present time are of the enclosed arc type, and we have some high c.p. metal filament lamps.

**HALIFAX.**—MR. W. M. ROGERSON writes: The difficulty most electrical undertakings are experiencing at the present time is the installation of high-pressure gas for outside shop lighting and street lighting, and we require, I think, a good arc lamp or metal filament lamp which can be installed, maintained, and run for 700 hours per annum for a charge of £4 to £4 10s. to the consumer.

**COVENTRY.**—MR. G. TOUGH says the lamps should be very suitable for exterior shop lighting, street lighting, and interior workshop lighting in sizes up to the 1,000 c.p.

**GRIMSBY.**—MR. W. A. VIGNOLES writes: Although large c.p. unshaded lamps outside shop windows form a crude and inefficient method of lighting, a certain number of shopkeepers will have them, and the gas company are getting a number of people to use high-pressure gas. With the half-watt lamp it should be possible to compete and more than hold our own against the gas interests. If the half-watt lamp sounds the death-knell of the arc lamp, I shall have no regrets, as I find it extremely difficult to pay sufficient attention to arc lamps to ensure satisfactory results.

**NEWPORT, MON.**—MR. A. N. MOORE writes: It must, of course, be only a matter of time before half-watt lamps of all normal candle-powers are put on the market, and this, in my opinion, is the serious aspect of the question from the central station engineer's point of view. It emphasises the necessity for the pushing forward vigorously of a heating and cooking campaign.

**EXETER.**—MR. H. D. MUNRO has been only waiting for the appearance of these lamps to bring out a scheme for extending electrical street lighting. For outside shop lighting, he thinks they will be even more valuable, as from his own observation he believes that the high-pressure gas lamp is anything but satisfactory to the consumer.

**CHELTENHAM.**—MR. W. J. BACHE thinks that the introduction of the half-watt lamp will not have much effect on output, and that its adoption for general use will be very much more gradual than that of the one-watt lamp. He believes, however, that it will lead to a considerable extension of outdoor and display lighting.

**BEDFORD.**—MR. R. W. PHILLIPS does not fear the advent of the half-watt lamp any more than he did the 1½-watt lamp.

**LUTON.**—MR. W. H. COOKE regrets that the lamps will only be made in very large candle-powers at first. These will meet a very great need as a competitor to high-pressure gas, but he looks forward without fear to the day when half-watt lamps can be obtained at the same price and similar candle-powers to the existing metal filament lamp.

**ASHTON-UNDER-LYNE.**—MR. N. APPELBEE will find an immediate use for the lamp in competing with high-pressure gas, which the local gas company offers to the public at very moderate terms, fixed and maintained free.

**WALSALL.**—MR. A. S. BARNARD anticipates that the lamp will prove the most useful and efficient counterblast to the high-pressure gas lamp for shop lighting.

**LOUGHBOROUGH.**—MR. W. H. ALLEN will welcome the lamp for use in street lighting and large factory installations where high-pressure gas is being employed.

**EASTBOURNE.**—MR. J. K. BRYDGES writes: Although at first the half-watt lamps will require separate transformers, as the smaller lamps will not be made for use on our 200-volt supply, they will prove most useful for lighting the outside of business premises and for other purposes, and as a satisfactory lamp to fight the high-pressure gas lantern.

**LEATHERHEAD.**—MR. H. L. DIXON writes: For street lighting and shop lighting, they will be a valuable weapon, and where the bulk of the station's output is for power their advent will have no detrimental effect on the revenue. Where lighting is the chief load, the future outlook is serious.

**LEYTON.**—MR. F. HARMAN LEWIS anticipates a demand for the lamps of medium size if experience shows they have reasonable life and are not too expensive.

**WATFORD.**—MR. A. W. BARRHAM writes: As the whole of the Watford street lighting is electrical, the half-watt lamp should undoubtedly be of good service, providing that the cost and life are such that the difference in current consumption is not nullified. After the benefits which have accrued to the central stations since the introduction of the metallic filament lamp with its low current costs, I see no reason to anticipate other than like results from the half-watt lamp.

A large number of further letters have been received, extracts from which will be published in our next issue.





## CORRESPONDENCE

### WHY WAS ENGLAND LATE?

*To the Editor of ELECTRICAL ENGINEERING.*

SIR,—The tungsten lamp owed its origin to the inventions of Auer von Welsbach and Just and Hanaman; it was to be expected, therefore, that it should appear on the Continental markets before it was manufactured in this country. The first drawn-wire tungsten lamps were developed from American and German patents, following upon researches carried out by the General Electric Co. of America and the Siemens Co. in Germany, and one cannot grumble because the electrical industries of those countries should have derived the first benefit from this improvement. But with the half-watt lamp it should have been otherwise. It is evident that the various firms who announced their half-watt lamps to-day are working in concert, and it is more or less common knowledge that some or all these firms have arrangements by which they are free to employ the processes patented by any one of them or their American and German associates. The half-watt lamp is apparently made in accordance with a process patented in America, and presumably available automatically, under this arrangement, to a number of these firms manufacturing lamps in England as well as to some of the German lamp manufacturers. Yet the Germans were able to develop their lamps, and to place them on the market at the beginning of October, and we in England are three months late. Why must this be so? In the days of the carbon filament lamps, the British-made lamp was second to none. We have many years' experience in the manufacture of tungsten lamps, our lamp factories are said to be as well equipped as those in any other country, and are presumably managed by men whose technical and commercial knowledge is of the best. Why must we lag behind Germany to the extent of three months? Why was England late?

Yours, &c.,

Jan. 12, 1914.

INDIGNANT BRITISHER.

### THE ELECTRICAL GEAR OF H.M.S. "INVINCIBLE."

*To the Editor of ELECTRICAL ENGINEERING.*

DEAR SIR,—An astounding announcement appeared in the *Pall Mall Gazette* on December 31st last, to the effect that the above vessel is to now have a refit at a cost of £200,000, most of which amount is to be spent in replacing the existing "electrical" gun-working gear by "hydraulic." It was stated that, although much money and time had been devoted to perfecting it, the electrical gear had turned out a failure.

I have been in touch with ship-owners and builders for many years now, and have endeavoured to enlighten them on the great economy of electric driving, and they are gradually coming to the conclusion that it is true. Many ships have been fitted with electric driving, and are in operation with great success in various parts of the world; still shipowners, when approached, will now say that if specialised men (as in the British Navy) cannot make and run electrical gear, they don't want it on their ships. Bearing in mind that the Merchant Marine is the greatest field for electrical driving, the result of the above statement concerning the *Invincible* is a great blow to the electrical power trade.

Now, Sir, the British Navy is a public service, for which the people of this country are paying plenty of money, and, as members of the joint ownership of this national service, we electrical engineers should now demand the true facts of this supposed failure, and a thorough investigation should be made by a representative body of electrical power engineers, to see if the failure is not without remedy, considering the enormous damage done to our industry.

This ship is one of four fitted with electrical power for gun-working in the British Navy, and was tried in 1908, when it was found that there existed certain defects. The question was raised in Parliament, and a reply was given that the defects were entirely got over in February, 1910, and now comes the news, after five years' devotion to the matter, that close on quarter of a million pounds sterling is to be spent in making the change.

I have no doubt that the existing electrical gear on the *Invincible* has defects, but I fail to see why the whole system of electric driving should be so condemned. We have at our disposal the latest polyphase alternating-current system for turret operation, and which can hold a gun on the target when ship and target are travelling at different velocities, or when the ship may be pitching or rolling; and, being alternating current, the well-known defect in all D.C. heavy torque and slow-speed power systems is avoided, and the torque-speed variation for either depressing or elevating guns or turret-turning can be, if anything, more effective than hydraulic methods—from, say, a motor speed of 600 r.p.m. down to, say, 1/15th revolution per minute, or 1 r.p.m. per quarter-hour with full torque

on, and with no steps in the speed or torque up to the top speed.

I give below a list which shows the numbers of ships in the navies of the world which have electrically-operated guns and ammunition hoists. It is strikingly interesting to note that even though the people have to pay nearly £50,000,000 per year on naval armaments, that Great Britain has four ships fitted with rapid-loading electrical gear, whilst other countries, from their actual war experience, are still demanding it. The number of ships fitted with electric gun equipments are as follows:—

France, 36; U.S.A., 32; Germany, 30; Japan, 18; Russia, 14; Austria, 14; Italy, 9; Great Britain, 4. Electrical gun gears are also used in the Chilean, Chinese, Argentine, Spanish, and Brazilian navies.

Comment on the above is almost needless. To say that electrical power is a failure is absurd. French, American, German, Japanese, Russian, and other naval artillery engineers have the experience of modern and practical warfare, especially those of Russia and Japan. The British electrical industry should demand an investigation into the matter before this public money is squandered.

Yours faithfully,

76 Gladsmuir Road, N.

WILLIAM P. DURTNALL.

## ELECTRIC TRACTION NOTES

To facilitate comparison of the results of electrical tests of conductor rails which are not expressed in the same terms, a complete edition of the test sheets, dealing with conversion factors, tables, &c., prepared by the Technical Bureau Department of Ridsdale & Co. (3 Wilson Street, Middlesbrough), is now available at the price of 6s. The sheets have hitherto only been obtainable singly. They are of considerable value.

A committee has been appointed by the Liverpool Corporation to consider in detail the scheme for running tramways under the Mersey.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The Portsmouth Corporation Telephone Committee's recommendation that their undertaking shall be transferred to the Government, the purchase-price being £35,000, has been adopted. The Portsmouth licence in the ordinary course would not expire until 1926, and an offer by the Postmaster-General to sell the Post Office system to the Corporation similarly to Hull was declined. Considerable interest attaches to this decision, as Portsmouth will be the last of the municipalities who set up telephone systems of their own, to deal with its undertaking under the altered conditions since the National Telephone Company was transferred to the Post Office. The Glasgow, Brighton, Tunbridge Wells and Swansea undertakings were disposed of some years ago, and, as reported in our columns last week, the Hull Corporation has decided to purchase the Post Office system there. Thus there will only remain one municipal system in the United Kingdom, but the action of the Hull Corporation and the lower rates which it intends to charge to the Post Office subscribers has set a number of other municipalities thinking in the same direction, and reports, among other places, from Dundee, Manchester, and Sheffield show that public opinion is inclined to be in favour of attempting to follow Hull, although, of course, it is extremely improbable that the Postmaster-General would sanction any such course, in the absence of an already existing municipal system.

The Inns of Court Hotel, Holborn, is to be purchased by the Post Office for the purpose of a new telephone exchange.

Marconi's Wireless Telegraph Co. was licensed on January 1st to conduct a wireless service between Poldhu and Spain.

On 6th inst. the Tenedos-Chio cable was restored.—On the 16th inst. it will be possible to send deferred telegrams to Monrovia, Conakry, Libreville, the Belgian Congo, &c. This class of telegram is not, however, admitted by the Amazon Telegraph Company.—Communication with Siam *via* Moulemein, and between Moulemein and Kanburi is down.—Telegrams for Siam are sent *via* Madras-Saigon. Telegrams for Santa Elena-Ecuador are subject to censorship. The Minister of Posts and Telegraphs of Albania notifies that cipher or code language is prohibited in private telegrams.—Communication with Siam was restored on January 10th.—The "Indo" lines were down between Kertch and Soukhouni-Kale on 11th inst., and restored on the 12th.—Telegrams to Syria are subject to delay, the lines between Adana and Alep and Diarbekir Alep being down.

## THE INCREASING USE OF H.T. OVERHEAD LINES IN THE UNITED KINGDOM

MANY engineers will be surprised to know that there are now over 1,000 miles of overhead high-tension transmission lines in the United Kingdom working at pressures from 2,000 to 20,000 volts. Of these, 115 miles are at 20,000 volts. The longest extends twenty miles, and one forty miles in length is under consideration. This information was given in the introductory remarks of a valuable Paper dealing with British practice in this direction, read by Mr. B. Welbourn at the Institution of Electrical Engineers last Thursday. The Paper has also been read at the Birmingham and Manchester and Yorkshire Local Sections.

The author estimated that for 6,000 volts an overhead line costs only about £900 per mile, compared with £1,400 for an equivalent cable, while for 20,000 volts the costs are £950 and £2,100 per mile respectively. Costs per mile, however, are not the only items to be considered in a transmission scheme, for, as an offset to the cost of wayleaves for overhead lines, cables generally have to follow more circuitous routes, as was pointed out in the discussion by Mr. W. B. Woodhouse (Chief Engineer and Manager, Yorkshire Electric Power Co.) and Mr. C. Vernier (Mains Engineer, Newcastle-on-Tyne Electric Supply Co.). It was also suggested that the present was an opportune time for the Institution Council to take up the consideration of the wayleave question with the Government, since, besides the tedious process of getting wayleaves at all in this country, the cost was more than sufficient to purchase a strip of land some 10 yds. wide for the whole length of the pole line in most other countries. The author also suggested that the Council might now usefully consider the appointment of a permanent Transmission Lines Committee, with a view to evolving standard specifications of materials, watching and reporting on important modifications of the Regulations and practice affecting overhead lines in this and other countries, advising the Council on representations to be made to the Board of Trade, other Government Departments, the Engineering Standards Committee, &c.

In the course of his Paper, Mr. Welbourn described systems of guarding conductors, and showed the simple triangular guard recently devised by Mr. A. P. Trotter, but he suggested that with the use of the latest automatic protective devices, it should be allowable to dispense with guard-wires altogether. There is reason to believe, he said, that the line wires become dead within one-eighth of a second after the occurrence of a fault, short-circuit, or the breakage of a wire, when the Merz-Hunter split-conductor system is employed. The Merz-Price system, on the other hand, although it will cut out the line within one-twentieth of a second when an earth fault or short-circuit occurs, will not deal with the case of the opening of a circuit by a wire breaking until the wire actually becomes earthed. Mr. Welbourn was of opinion that the time was approaching when it would be justifiable to ask for the Board of Trade's consent to run high-tension lines along public roads where the conditions are suitable. Mr. Trotter, speaking, we presume, unofficially as usual, said that the B.O.T. regulations could be regarded as representing the best practice of the day. He himself had proposed years ago that high-tension lines could be run along the sides of roads, but it was found to be hardly worth while, since all the straight roads were already monopolised by the Post Office. He noted that Mr. Welbourn was in favour of using transformers on the poles for affording supply to consumers on the route, but he would be very sorry to see little transformers, the size of hat boxes, dotted along a line, as they were very dangerous. Commander Schwann, R.N. (Admiralty Aerial Department), spoke of the danger to aerial navigation of cross-country lines from fire, and also because they were very difficult to see. He suggested that they might be limited to certain areas, and maps of the positions of all the lines in the country prepared. Mr. Welbourn, in reply, said that the point was an entirely new one to him, and he thought that it might be advisable to forbid overhead lines within a radius of five miles or so of any coast air-station, so as not to interfere with the defences of the country.

Although the subject of earth plates and earthing was dealt with quite briefly in the Paper, a considerable portion of the discussion was devoted to it. It is now generally recognised that a continuous earth wire should be run along all overhead transmission lines, and earthed frequently by small plates about 1 ft. 6 in. square. Another point mentioned was the trouble experienced in all parts of the country by birds earthing the lines through their bodies.

The author advised the use of aluminium in preference to copper when the cost of the former gives the cheaper line, except where the air is laden with sulphurous products. In this connection Mr. Woodhouse pointed out that with aluminium the sag is greater, and therefore higher towers are necessary, and a greater spacing must be adopted. Pressure regulation is not so good by something like 4 per cent.

Mr. Welbourn summed up in an admirable manner the present knowledge as to lightning arresters, and the reasons for failure of the horn arrester combined with a non-inductive resistance in the earth circuit, and a choking coil in series with the line. Moscicki condensers, although high in first cost, he said, are slowly coming into use, but are always installed, as a matter of course, on new lines. Messrs Merz & McLellan have discarded lightning arresters on all new lines connected through step-up and step-down transformers, and adopt the device of increasing the insulation of about 10 per cent. of the end turns of the transformers connected to the line by 300 or 400 per cent.

Telephone and pilot circuits were fully discussed by Mr. Welbourn. Suspended lead-sheathed cables are commonly used for this purpose. The author attributed failures of these to the omission of the necessary 2½ per cent. of tin in the lead sheath and unsatisfactory suspension. He described and eulogised a form of suspension patented by Mr. C. E. Elder, and used in the Newcastle district. The lead sheath, he recommended, should be definitely bonded at every fifth pole to the supporting earth wire in order to carry away any charges induced by the power lines.

No Paper or discussion on overhead transmission lines is complete without the usual comparison between steel and wooden poles. In the industrial districts, Mr. Welbourn pointed out that the spans do not usually exceed 85 yds. in length, so that it is cheaper to use wood poles; but in any case, he explained, steel poles should not be used in a smoke or fume-laden atmosphere, without careful consideration. In any case all steelwork should be galvanised and treated with a bitumastic paint. Wood poles should be erected soon after creosoting, and should not be cut after this if it is avoidable. Any incision made should be treated with a hot tar. Mr. Vernier said that he had never yet been able to make out a case for steel poles, but Mr. C. W. Kay (Callender's Cable & Construction Co.) described the simple tubular steel pole, of great strength and very easy to erect, recently perfected by his firm.

On the question of the spacing of conductors, the author recommended a minimum of 3 ft. apart for 20,000 volts, 2 ft. 6 in. for 11,000 volts, and 2 ft. for 3,000 volts and for 6,000 volts, but Mr. Woodhouse thought these spacings too great. There is a growing tendency to mount the lines horizontally or vertically, but duplicate circuits often suffer equally in a storm, so that, as Mr. Vernier said, there is more chance in case of an accident to continue the supply on a ring main system. For the tying-in of conductors the author condemned the rigid and advocated the flexible binder; he also described a "semi-rigid" one designed by Mr. G. K. Paton, and used with success by the North Wales Power and Traction Co. Galvanised channel, he said, is found most useful for the cross arms, but this, being earthed, has one disadvantage on lines which are operated with an earthed neutral and are controlled by any form of instantaneous overload or automatic protective apparatus. Big birds, chiefly crows, stand on the arms and peck at the live wires with results altogether disastrous to themselves, but involving nothing worse than a shut-down of the line and an interruption of the supply. This trouble is usually experienced from May to August while crows are young and presumably learning wisdom. The difficulty has been overcome on several lines by providing porcelain bushes round the insulator pins—pin-type insulators are generally used—from the channel arms upwards into the insulator, and by clipping pieces of bitumenised fibre conduit on to the arm so as to insulate the bird. On delta-connected lines birds are frequently killed, but no shut-down of the line is involved.

As the working voltage has scarcely any influence on the first cost of a line, the author put forward the suggestion that, in view of the rapidly increasing loads in industrial districts, all main lines should be designed so that they might ultimately be worked at a higher pressure than that at which they are first operated. For instance, 6,000- and 11,000-volt lines might be designed for a pressure of 20,000 volts, and 20,000-volt lines for 40,000 or 50,000 volts. He thought that there could be no doubt that the time is approaching when there must be a further raising of working pressures on main alternating-current high-tension circuits, similar to the big change which was made in passing from 11,000 to 20,000 volts on underground cables eight years ago.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,374.

When an induction motor develops a loose connection in the rotor, the ammeter will be caused to set up a periodic swing. It is desired to know the relationship which exists between this swing, the frequency, and the number of poles. Explain fully what causes the swing.—"DUB."

(Replies must be received not later than first post, Thursday, January 22nd.)

### ANSWERS TO No. 1,372.

When slow-speed alternators of low reactance and fine regulation are coupled in parallel with high-speed turbo-generators with high reactance and coarse regulation, can the voltage of the circuit be kept constant by installing one automatic regulator? If this be possible, and as the load saturation characteristics of the two types of alternators must differ, how is the excitation point determined at which connection should be made to the regulator, in order to obtain the best results as regards constant voltage?—"X."

The first award (10s.) is made to "W. A. H." for the following reply:—

When slow speed alternators of low reactance and fine inherent regulation are running in parallel with high-speed turbo-generators with high reactance and coarse regulation, it is quite possible to control the voltage of supply by means of one automatic voltage regulator. The best method of accomplishing this is to connect the regulator to the largest machine, and to carry out the whole of the regulation on this one machine. If this machine happens to be the machine with the coarse inherent regulation (as is generally the case, the turbo-plant being usually of large units), the matter is greatly assisted. The remaining machines are then set with a constant excitation, the value of which depends a great deal on the conditions. This method is usually termed "trailing." For example, we will take it that the load variations are from no load to full load of the whole of the running plant. The best results would then be obtained by setting the excitation of the uncontrolled or trailing machines to the excitation required to give normal volts at half load, and at this point the regulator will adjust the excitation of the machine under its control to the value required to give normal volts at half load, and the power factors on each machine will be equal.

At no load the excitation of the trailing machines would be too high, but the regulator will maintain the supply voltage at its normal value by weakening the field of the machine under its control sufficiently to allow it to draw a magnetising current from the trailing machines of a value just large enough to reduce the voltage of these machines to normal. The value of this magnetising or wattless current depends on the inherent regulation of this machine, but being 90 deg. out of phase with the potential, it has a great demagnetising effect, and therefore does not reach an appreciable value. Of course, the reverse operation takes place at full load, that is to say, the trailing machines are then under-excited, and the regulator will then increase the excitation of the machine under its control sufficiently to meet its own requirements and to allow it to supply a

magnetising current to the trailing machines. It will be seen from this that it is considered advisable to connect the regulator to the largest machine, due to the fact that the smaller machine will then only be required to supply the magnetising current when running on low loads, and this is assisted if the regulator is on the machine with the coarsest regulation, as the amount of magnetising current that is required for the trailing machines when on top load is less, due to the fine inherent regulation of these machines.

The conditions given above are very severe, as usually the plant is running with a certain amount of constant load with variation over and above this. It can be taken that under most conditions the best value of excitation for the trailing machines is a value corresponding to that required to give normal volts at a load equal to the constant load plus half the maximum variation. A large number of installations are in operation on the above system with the well-known Tirrill regulator, where it has been found possible to maintain the supply voltage within 1 per cent. Of course, one regulator can be used to control the supply of a number of alternators by making the regulator operate on a booster either in series with the fields of the exciters or the fields of the alternators, but these schemes have no advantages in cases as mentioned above, more especially if the exciter voltages differ, as all the machines are subjected to the same increase in voltage, which may be a larger percentage of one than of the other. For example, suppose the range of excitation voltage on the close regulated machines is 50 to 100 volts from no load to full load, and that of the coarser regulated machines 50 to 150. If all the fields are taken through a common booster, and the machines are running at the time at no load, and sufficient load is thrown on so that the regulator operates to make the booster give 50 volts, it would mean that the excitation voltage of the close regulated machines would be increased from 50 to 100 volts, i.e., full excitation, whereas the coarser regulated machine, which really required the greatest increase in excitation, has its excitation only increased from 50 to 100 volts, which is only two-thirds full excitation; greater discrepancies than these will occur if the values of the excitation voltages are wider apart than those given above.

The second award (5s.) is made to "W. H.," who writes substantially as "W. A. H.," and says:

The alternator or alternators controlled by the regulators (connected as already mentioned) will take all the variation in load, and their field currents will be automatically adjusted to suit the load and to give constant voltage. The generators under hand control will keep a constant load, and therefore a constant voltage, without any adjustment of the excitation current. In cases where large variations in load are met with, such that any similar machines in the station would not be together capable of dealing with them, the regulator is arranged to have sufficient relay contacts to deal with the exciters of all the alternators which are to be automatically regulated, and the connections to the exciter field resistances will be made so that at the average load each alternator is taking the correct field current. That portion of the field resistance of each exciter which is automatically cut "in" and "out" of circuit by the regulator contacts is then separately adjusted on each individual exciter, such that the corresponding alternator receives as closely as possible the correct excitation current for the various loads. Machines having bad regulation will have a greater proportion of the exciter field resistance operated on than will those machines having good regulation, thus giving in the former larger variations in field current. It will be understood that the excitation will be only approximately correct, and that the alternators will take a leading or lagging current from the bus-bars depending on whether the machines are over- or under-excited. There are variations in the methods outlined above, such as paralleling the exciters of similar machines on to exciter bus-bars, but they all use the same principle.

**Electricity v. Gas.**—Mr. C. H. Yeaman (Borough Electrical Engineer, Stoke-on-Trent) asks for suggestions for more or less reliable figures for comparison between gas and electric lighting with  $1\frac{1}{4}$ -watt lamps under existing conditions. He suggests that a fair comparison would be to take gas with a low-pressure mantle burner as giving a mean value of about 45-c.p. for 3 cub. ft. per hour. 60-c.p. with  $2\frac{1}{2}$  cub. ft. per hour is generally claimed, but a gas mantle falls to about two-thirds of its efficiency after about the first 100 hours. The gas engineer had stated, however, that he was prepared to guarantee 30-c.p. per cub. ft. of gas per hour.

**The "Northampton Gazette."**—The last issue of this official publication of the "Northampton" Past Day-Students' Association contains notes on the doings of several old students in this country and abroad. The latter are quite interesting. There is also a report of the address recently delivered by the President of the Association, Mr. H. K. Whitehorn. It is suggested that Past Students might make more use of the Appointments Bureau than they have in the past. It is pleasing to read in this connection that the Bureau is "constantly being offered openings of all kinds, electrical, mechanical, scientific, and literary, and usually is unable to find men."

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 40. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**MAZDA HALF-WATT LAMPS.**—This is a four-page leaflet sent by the British Thomson-Houston Co., Ltd. (77 Upper Thames Street, E.C.), giving the fullest information with regard to the sizes and prices of the Mazda half-watt lamps, illustrations, and prices of special lanterns and fittings designed for them, and also of lamp-holders.

**OSRAM HALF-WATT LAMPS.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.) have issued a list of Osram half-watt lamps, embodying some of the particulars given in our article this week. A facsimile of the list appears in the advertisement pages in the centre of this issue. It will be noticed that a useful feature of this is a set of dimension diagrams.

**WOTAN HALF-WATT LAMPS.**—The pamphlets issued by Siemens Bros. Dynamo Works (Lamp and Fittings Department, Tyssen Street, Dalston, N.E.), are reviewed on a later page.

**THE NITRA LAMP.**—The Electrical Company, Ltd. (122-124 Charing Cross Road), have sent us a price list of their "Nitra" half-watt lamps and fittings. A description of the lamp appears on a later page.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**"E.C." JOURNAL.**—The first issue of this new monthly publication of The Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.) is now available, and is being sent to the company's customers. It contains references to the vast business carried by the A.E.G., which, as most of our readers know, is the parent company, and the allied companies. There are notes on the arrangement and equipment of the various factories, and articles on the "Half-Watt" lamp and prepayment meters. Curves are given showing the variation in the price of raw materials, electrolytic copper, spelter, tin, lead, Para rubber, and cotton, during December, as compared with December, 1912. A useful addition is a stock sheet of A.C. and D.C. motors in the London stock just prior to the day of publication. It is announced that the company is shortly to issue a bound price list of some 1,000 pages, 8½ in. by 5½. It will be a complete and concise combination of all the various sectional lists that have been lately issued. These are also being reprinted. The list will be sent to intending purchasers of The Electrical Company's goods, and the cover, which will be finished in dark brown linen, will have the recipient's name in gold lettering on it. Enclosed with the current issue of the "E.C." Journal is a clear 4-inch aluminium pocket rule, which is also divided into centimetres.

**MAGNET COILS.**—A leaflet just published by the British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), points out the advantages of magnet coils in which aluminium, protected only by the skin of oxide, is used.

**ALUMINIUM.**—Other leaflets from the same firm deal with aluminium netting and gauze, aluminium mandrils for rubber manufacturers, and the uses of aluminium in the automobile chassis.

### NEW YEAR SOUVENIRS, &c.

Simplex Conduits, Ltd., are always original in their ideas, and the Editor has this year received from them not only a copy of their useful pocket-book and diary, but a most ingenious pen and pencil rack, consisting of upright tubes standing up from the lid of a cast-iron box, and all similar to their well-known conduit material. The gift is complete with black, blue, and red pencils, indiarubber, and compass, and is most acceptable.

The General Electric Co., Ltd., has sent a refill for 1914 to be used in the useful desk calendar distributed to its friends last season.

A calendar with a delightfully humorous illustration is that issued by Pinchin, Johnson & Co., Ltd., well known to our readers as manufacturers of varnish for electrical purposes. A puppy who has upset a pail of bright-coloured colouring material is regarding the mess, and remarking, "I think I've got distemper."

### THE OSRAM HALF-WATT LAMP

THE Osram half-watt lamp is illustrated below. It is made in all the sizes mentioned on page 31, at a uniform efficiency of approximately half-a-watt per British candle power. The relative sizes of the bulb and filament are clearly shown in the illustration. For the 300 and 500-watt sizes the bulb is 5½ in. in diameter and 11½ in. long; the 1,000-watt size is 6½ in. in diameter and 12½ in. long; and the 1,500-watt size, 7½ in. in diameter and 14½ in. long. The filament consists of a continuous length of pure drawn tungsten wire formed into a series of spirals which are mounted as shown, and we are informed that its mechanical strength even surpasses that of the ordinary tungsten lamp. The bulb is filled with an inert gas such as nitrogen, and the high efficiency is due to the high temperature of the filament, which is about 500° F. higher than that of an ordinary tungsten lamp. At this temperature the light approaches to



sunlight in whiteness: the filament has an intrinsic brilliancy about eight times that of the ordinary tungsten filament, or twenty times that of the carbon lamp.

The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), state that exhaustive tests have shown that the average burning life of the half-watt Osram lamp is 1,000 hours, during which period the candle power is practically constant. The uniformity of the light distribution is excellent, as might be expected from the shape of the filament, and the ratio of mean spherical to maximum horizontal candle power actually averages 85 per cent. Moreover, the concentration of the filament in a small area assists the design of reflectors to give any required distribution.

As will have been gathered from the dimensions given above, the bulbs of the Osram half-watt lamps are smaller than those of ordinary tungsten lamps of the same wattage, but it is claimed, nevertheless, that there is hardly any loss of candle power due to blackening, as any deposit which forms merely coats the upper part of the lamp, owing to the convection currents.



During some time past the Osram Lamp Works have been busy manufacturing, and the General Electric Co. had, at any rate on Monday, when the lamp appeared on the market, a large stock in hand ready for delivery. Central station engineers on Monday were offered small quantities delivered immediately, if ordered by return of post, and were informed that the works had now a considerable and rapidly increasing output of these lamps. In ordering lamps it should be stated whether they are for series burning, as, for this, only lamps with the same series number marked on them should be run together. Harrod's Stores, presumably by special favour, have already some Osram half-watt lamps in use.

### THE MAZDA HALF-WATT LAMP

THE advent of the half-watt lamp—an almost revolutionary development in incandescent electric lamp manufacture—was announced by the British Thomson-Houston Co., Ltd., towards the end of last August. Specimens of the lamp were then exhibited, for the first time in this country, at the Company's London Offices, Mazda House, 77 Upper Thames Street, E.C. An account of the demonstration and a description of the lamp was published in ELECTRICAL ENGINEERING on August 28th and September 4th.

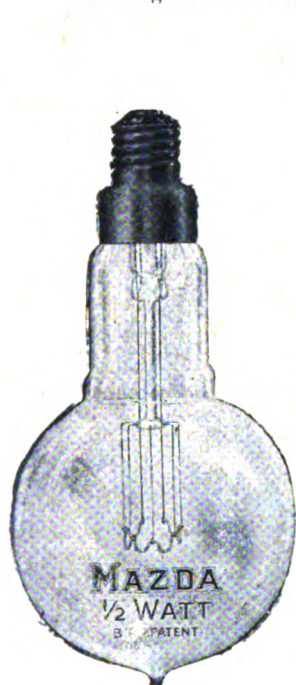


FIG. 1.

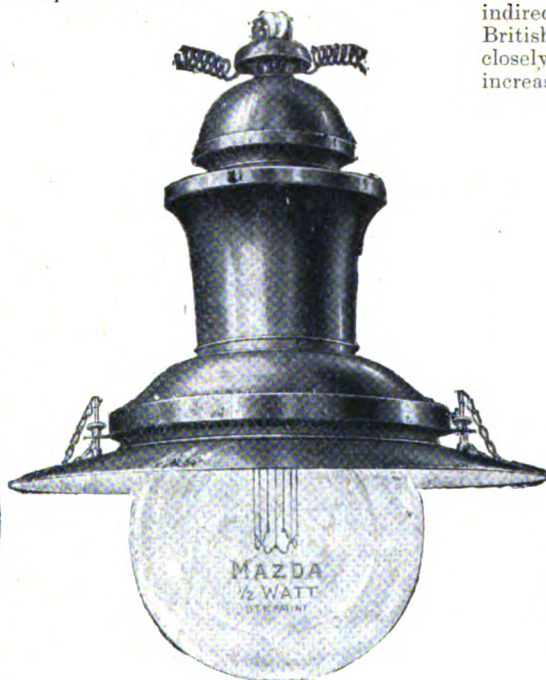


FIG. 2.



FIG. 3.

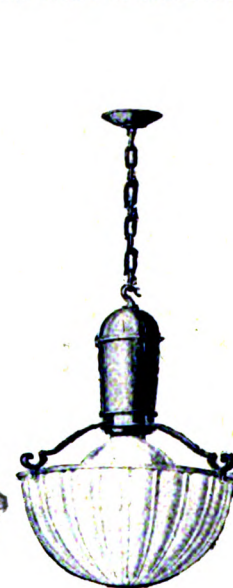


FIG. 4.



FIG. 5.

FIG. 1.—1,000 c.p. 100-volt. Mazda "Half-Watt" lamp. FIG. 2.—Special weatherproof fitting for Mazda "Half-Watt" lamps. (This fitting can also be supplied without reflector. It is finished in durable black stove enamel, and is properly ventilated.) FIG. 3.—Special Mazda "Half-Watt" fitting equipped with Alba glass sphere. FIG. 4.—Alba semi-indirect lighting fitting, specially designed for use with Mazda "Half-Watt" lamps. FIG. 5.—Store fitting for use with Mazda "Half-Watt" lamps in shops, &c. (This fitting consists of a dome made of opalescent glass, covered on the under side with a cut glass bowl supported by a hinged ring.)

The preliminary announcement of the Mazda half-watt lamp aroused, as it deserved to do, a tremendous amount of public interest, and we are informed that since August inquiries on the subject have been pouring into Mazda House. The British Thomson-Houston Co. now state that they have completely standardised the production of these lamps at their Rugby factory, and are in a position to accept orders for them.

Below is a brief tabulation of the chief features of the Mazda half-watt lamp, as put forward by the makers:—

*Efficiency.*—Half-watt per candle, or two candles per watt.

*Average Useful Life.*—800 to 1,000 hours.

*Quality of Light.*—Owing to the high temperature of the filament, the light is much whiter in colour than that of the ordinary tungsten lamp, and approximates very closely to daylight.

*Intrinsic Brilliancy.*—The intrinsic brilliancy of the Mazda "Half-Watt" lamp is eight times as high as that of the ordinary tungsten lamp. For interior lighting this high intrinsic brilliancy renders it essential that Mazda half-watt lamps should be enclosed in suitable diffusing spheres or bowls in order that the light may be agreeably diffused and effectively distributed.

The sizes in which the Mazda half-watt lamp is available are given on page 31.

The bulb of the lamp, instead of enclosing an almost perfect vacuum, is filled with an inert gas such as nitrogen.

The use of a gas-filled bulb and a special form of drawn-wire tungsten filament, wound in a close spiral and mounted in short loops, are the constructional features chiefly responsible for the high efficiency of the new lamp. The Company point out that this epoch-making advance in lamp efficiency was only rendered possible by the invention of the drawn-wire tungsten filament, which was also a Mazda development, and is covered by fundamental patents owned by the British Thomson-Houston Co., Ltd.

With the placing on the market of the half-watt lamp there is now available a range of Mazda lamps in sizes from 1 c.p. to 3,000 c.p., suitable for all commercial voltages, and applicable to every conceivable lighting purpose.

In addition to the Mazda half-watt lamp, the British Thomson-Houston Co. have developed a range of special fittings for use therewith. For outdoor purposes—the lighting of streets, shop-fronts and open spaces—some very effective weatherproof lanterns, fitted with reflectors and opalescent globes, have been designed. As already stated, the high intrinsic brilliancy of the Mazda half-watt lamp makes the use of diffusing globes and bowls very desirable for interior lighting, and the Company have accordingly designed a number of fittings equipped with their well-known Alba and Veluria glassware. The half-watt lamp is, of course, specially adapted to indirect and semi-indirect lighting, with which systems the British Thomson-Houston Co. have identified themselves so closely. Undoubtedly the new lamp will very considerably increase the vogue of these forms of illumination.

The makers also look forward to a wide sale of the lamp for displacing the arc lamp and the high-pressure gas lamp for outside lighting.

Further information and prices of Mazda half-watt lamps and fittings will be found in the B.T.H. Co.'s price list No. 11,000, for copies of which readers are invited to write to Mazda House, 77 Upper Thames Street, E.C.

**The "Z" Half-Watt Lamp.**—The "Z" Electric Lamp Manufacturing Co., Ltd. (Oriel House, Cannon Street), have placed a series of half-watt lamps on the market, of the sizes given on page 31.

**Drake & Gorham.**—Messrs. Drake & Gorham, Ltd. (1 Felix Street, S.W.), inform us that they are supplying half-watt lamps of all makes on their usual terms. They have already put in four 1,000-watt lamps at Epsom for street lighting.

**Advertising Electricity Supply.**—The Ipswich Corporation, Electric Supply and Tramways Departments, have some neatly designed postcards for sending to prospective consumers. Of these, one is boldly arranged so as to call attention to the safety of electricity as regards fire; and another explains the simple control, and concludes with a reference to the Department's rental wiring system. A series of bookmarkers, issued with the Free Library books, deal each with one of the good points of electricity in the home.



### THE ROYAL EDISWAN HALF-WATT LAMP

THE Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), in bringing to the notice of their customers the Royal Ediswan half-watt lamp, state that these lamps will be offered in the following sizes for the present:—

Volts.	Watts.	C.P.
50-65	300	600
" "	500	1000
" "	1000	2000
" "	1500	3000
100-130	500	1000
" "	1000	2000
" "	1500	3000
200-250	1000	2000
" "	1500	3000

It will be seen that two sizes, 1,000 and 1,500-watt at 50-65 volts, are included, in addition to those tabulated on page 31.

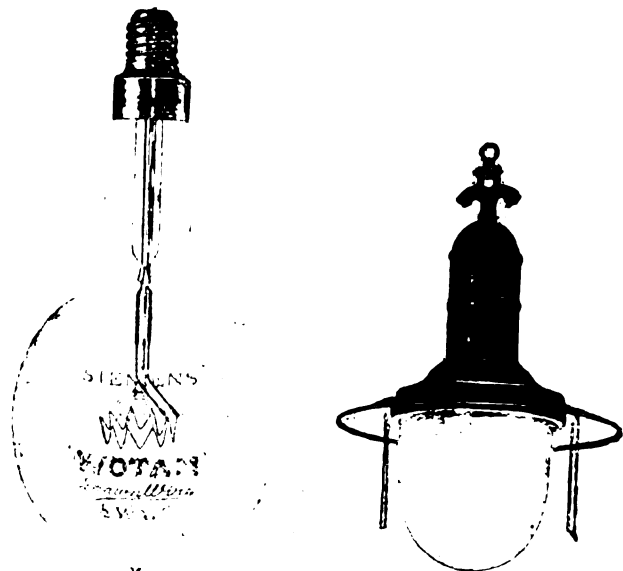
They also recommend their customers to obtain the special lantern fittings with reflectors and globes for use with this class of lamp, especially when the lamp is used for outside lighting. The smaller candle power lamps of this type are quite suitable for inside shop-lighting, and wherever a strong light is required.

The Edison & Swan Co. have installed some of these lamps at their showrooms at College Hill, and at their Queen Street offices, for their customers to judge of the general appearance and effect of this class of lamp.

### THE WOTAN HALF-WATT LAMP

SIEMENS BROS. DYNAMO WORKS, LTD. (Lamp and Fittings Department, Tyssen Street, Dalston), embody the particulars of their Wotan half-watt lamps and lanterns in two small, neatly printed pamphlets. Some particulars of these lamps appeared in our columns on December 18th, and the sizes are those which appear on page 31 of our present issue. The shape of the lamp is shown in the illustration below, and it will be seen that it is slightly longer in the neck than some of the other makes.

In their pamphlet, the company state that the candle-power of Wotan half-watt lamps is taken, not as in the case of lamps of the one watt per c.p. type on the horizontal c.p., but on the



WOTAN 2000 C.P. 200/260  
VOLT "HALF-WATT" LAMP.  
Scale: About one-fifth full size.

"GATESHEAD" WEATHER-  
PROOF LANTERN.

average c.p. in all directions below the horizontal, i.e., it may be considered as the useful c.p. obtained without the help of a reflector.

As regards perfection in manufacture, strength, and durability, the Wotan half-watt lamp is identical with the standard types of Wotan lamps at present on the market. Perhaps the most interesting features of the new lamps are the novel arrangement of the filament, the fact that the bulb is filled with an inert gas, and its extremely low current consumption.

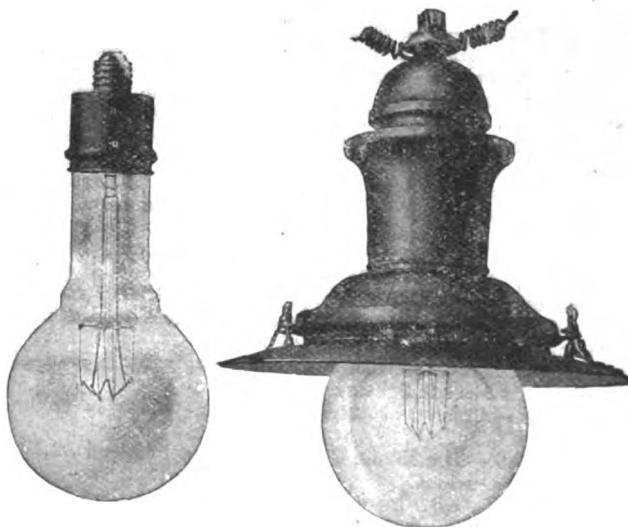
Wotan half-watt lamps, the pamphlet continues, give a powerful illumination closely approaching strong sunlight, the similarity extending not only to the appearance of the illumination, but also to the "spectrum" of the light emitted. The

whiteness of the light given, together with the mechanical strength of the lamps, should ultimately secure their universal adoption for the lighting of large areas, photographic studios, &c., &c.

We illustrate one of the many types of lanterns recommended by the company for half-watt lamps.

### THE NITRA LAMP

THIS is the name given by the Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.), to their half-watt lamp. The voltages and candle powers are the same as those given on page 31, but it will be seen from the illustrations below that the lamp has one very distinctive feature—there is no "pip." Another difference is the absence of the shoulder near the cap. The bulbs have long necks, and, except in the 300- and 500-watt sizes, are very much larger than those of other makes. The 1,000-watt lamp is  $7\frac{1}{8}$  in. in diameter and  $17\frac{1}{4}$  in. long, and the 1,500-watt lamp is  $9\frac{1}{8}$  in. in diameter and  $19\frac{1}{4}$  in. long. Nevertheless, the

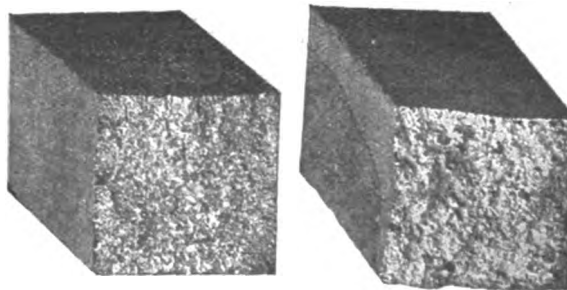


NITRA LAMP.

NITRA LAMP IN SPECIAL  
REFLECTOR LANTERN.

bulbs are still smaller in diameter than those of ordinary (1-watt) high candle-power tungsten lamps. The object in placing the cap as far as possible from the bulb is to keep the heating down to a minimum. It is claimed that the mechanical fixing of the cap is such that loosening is impossible, even if the cement breaks away after long use. The bulbs are filled with nitrogen slightly below atmospheric pressure, viz., at 9 lb. per sq. in. Curves of light distribution were published in our issue of January 1st. The Nitra lamp has been in actual use in Berlin since September, and has been used for lighting the Tiergarten and the Kurfürsten Opera in that city. It is said to have a useful life of approximately 800 hours.

### "PRANA" DIE-CASTINGS.



We here illustrate two sections of "Prana" Alloys which are not only (as can be seen) entirely free from blow holes, but do not distort or disintegrate.

Write for Leaflet E E 3.

AERATORS, Ltd., EDMONTON, LONDON.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Dorking.**—Mains extensions (£2,000).

**Dublin.**—An expenditure of £15,000 is contemplated in the financial year 1914-15 upon new mains, services, meters, &c. In addition, an expenditure of £3,258 is recommended for the reconstruction of the Pigeon House Fort power station switch-boards.

**Guildford.**—Barometric condensing plant, capable of dealing with 15,000 lbs. of steam per hour. Guildford Electricity Supply Co.

**Leigh (Lancs.).**—Extensions to generating plant (£12,000).

**London: Hackney.**—Various mains extensions are contemplated.

**St. Marylebone.**—Twelve months' supply of stores, including wood troughing, meter boards, casings, underground cables, house cables, flexible cords, box compound, and insulating materials, &c. Borough Electrical Engineer, February 11th. (See an advertisement on another page).

**St. Pancras.**—The Borough Electrical Engineer has reported upon additional extensions at the King's Road station, estimated to cost £51,218. He calculates that a saving of £12,000 per annum will be made when this new plant is in full operation. The details of the new plant are as follows:—Buildings, &c., £20,298; coal handling plant, &c., £3,190; four boilers, &c., £22,530; condensing pipes and pump accommodation, £2,200; railway sidings, £1,900; contingencies, £1,100. The Council has already sanctioned a new turbine at an estimated cost of £15,000.

**Lytham.**—The Council has decided to apply for a loan of £23,700 for its electric lighting scheme.

**Monmouth.**—A loan of £1,800 for new cables is to be applied for.

**New Zealand.**—The Napier Council proposes to spend £2,500 upon mains extensions.

**Shipley.**—A L.G.B. inquiry has been held concerning a loan of £27,000 for new plant and cables.

**Wakefield.**—A L.G.B. inquiry was held last week concerning a loan of £13,000 for new plant and mains.

**Walsall.**—The Corporation has decided to proceed with the new power station scheme designed by its consulting engineer, Mr. E. M. Lacey, and as a first step, the necessary land is to be acquired.

Mains extensions at an estimated cost of about £600 are to be carried out.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barnet.**—New Council offices.

**Blackpool.**—Hotel, £250,000. New school for 900 children.

**Bournemouth.**—New pavilion (£60,000).

**Bridlington.**—Workmen's housing scheme (£3,150).

**Broadstairs.**—New school. Kent Education Committee.

**Caister.**—Electric lighting of workhouse. Clerk to Guardians.

**Chester.**—Garden village consisting of 180 houses.

**Dewsbury.**—Proposal to electrically light all Council schools.

**Doncaster.**—Cinematograph theatre, St. Sepulchre Gate.

**Hertford.**—New County Council school. County Surveyor, Hatfield.

**Llandudno.**—New cinematograph theatre.

**Manchester.**—40 points, lighting, heating and cooking, private house. 15 High Street, Chorlton-cum-Hardy.

**Middleton.**—New Town Hall.

**Northwich.**—Forty-eight workmen's cottages (£8,500). Town Clerk.

**Widnes.**—Additions to hospital.

### Miscellaneous

**Belfast.**—Tenders are invited for annual supplies, including electrical sundries, for the Electricity and Tramways Departments.

**Cheltenham.**—Twelve months' supply of electric lighting fittings. Borough Engineer, January 31st.

**Harwich.**—Some electrical plant is required at the pumping station of the Corporation at an estimated cost of £245.

**Kirkcaldy.**—An expenditure of £3,000 upon new tramcars is contemplated.

**New Zealand.**—The Napier Council proposes to spend £3,000 upon new tramcars, &c.

**Wolverhampton.**—One boiler feed-pump. Borough Electrical Engineer. January 26th. (See advertisement on another page.)

## TENDERS RECEIVED AND ACCEPTED

**Aberdeen.**—A contract has been placed with Messrs. T. C. Smith & Co. for the provision of forty-six additional lamps for street lighting purposes in the Ballater district, bringing up the total number of lamps to the 1,500 guaranteed by the Corporation.

**Bournemouth.**—The tender of the British Westinghouse Co. has been accepted for the electric lighting of the Undercliff Drive.

**Manchester.**—The following tenders have been accepted:—Traction storage battery, Chloride Electrical Storage Co.; reversible booster, regulator and switchgear, Lancashire Dynamo & Motor Co.; cable, Electrical Engineering & Equipment Co.; two 500-k.v.a. static transformers, Siemens Bros. Dynamo Works, Ltd.; two 300-kw. rotary converters, British Westinghouse Co.; metal filament traction lamps, Drake and Gorham.

**Rathmines.**—Contracts have been placed with Messrs. Bellis and Morcom and the British Westinghouse Co. for two 200-kw. generating sets. The total price is £1,003.

**Southport.**—The Corporation has accepted the tender of the British Westinghouse Co. for an alternator at £1,920.

The Edison & Swan United Electric Light Co. has secured contracts for the supply of Royal Ediswan Lamps to the Cunard Steamship Co., Elder, Dempster & Co., and Cammell, Laird & Co.

## APPOINTMENTS AND PERSONAL NOTES

By an unfortunate error, we referred in our last issue to Mr. Cyril Clarke as the Borough Electrical Engineer at Birkenhead. This was not correct. Mr. Cyril Clarke has been appointed Tramways Manager at Birkenhead in succession to Mr. W. Wyld (who was appointed Chief Electrical Engineer at Hampstead last year). The salary is at the rate of £350 per annum, rising £25 yearly to £450. On Mr. Wyld's resignation from Birkenhead, the dual position of Borough Electrical Engineer and Tramways Manager was abandoned, and Mr. G. P. Shallcross was appointed Borough Electrical Engineer.

Mr. David Tattersall has resigned his position as Engineer and Secretary to the Ingleton Electric Lighting & Power Co., and is taking up the position of Mains Engineer with the Hindhead & District Electric Light Co. Mr. W. G. Hurst, late Chief Assistant at the Heckmonkwiike Electric Supply Station, has been appointed to succeed Mr. Tattersall.

The Chesterfield Corporation is recommended to increase the salary of Mr. R. L. Acland to £500 per annum, representing £350 as Electrical Engineer, and £150 as Tramways Manager.

The Portrush District Council requires an electrical engineer to take charge of the electricity works which are shortly to be erected. Applications to Town Clerk by January 31st.

An assistant is required in the street lighting department of a Midland municipality. (See advertisement on another page.)

**FOR**

# STEAM JOINTS

**USE**



**JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.**

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published January 8th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

28,945/12. **Analysis of Gaseous Mixtures.** SIEMENS BROS. & Co. (*Siemens & Halske*). The density of a gas of known constituents is compared with that of a standard gas on a single instrument. The pressure difference required to produce a certain acceleration in the gaseous mixture acts on a lever, or sliding contacts are caused to vary the resistance in an electrical circuit as the gas pressure varies. The indicating instrument is of the d'Arsonval type, with two coils. Four figures.

29,338/12. **Pressure Regulation of Rotary Converters.** SIEMENS DYNAMO WORKS and J. C. WILSON. The exciter shunt field winding is in series with a resistance controlled by an automatic regulator with its coils connected on the D.C. side of the set. One figure.

29,389/12. **Refractory Material for Radiators or Furnaces.** B.T.-H. Co. (*G.E.Co., U.S.A.*). Silica, carbon, and an aluminium silicate with or without manganese oxide is heated in a "smothered arc" furnace until reduction takes place. A sublimate is formed and condensed in a housing round the furnace. The product will stand compression without much loss of its heat insulating properties. The proportions of the constituents used are approximately 4:2:4:1.

2,001/13. **Drawing Tungsten Wires.** B.T.-H. Co. (*G.E.Co., U.S.A.*). A liquid lubricant, comprising an aqueous suspension of finely divided graphite containing a binding material, such as glucose, sufficient to cause the graphite to adhere firmly to the wire, is used. The wire is lubricated by the application of the lubricant, which is then carbonised by the heat of a gas flame, so as to cause the adhesion of the lubricant.

2,901/13. **Incandescent Lamps.** B.T.-H. Co. (*G.E.Co., U.S.A.*). To prevent blackening of incandescent lamps, cryolite, a double fluoride of sodium and aluminium, is ground to a powder; made into a paste and applied to a part of the lamp interior, where a temperature of between 300° C. and 800° C. is attained during normal burning. The claims cover the use of a double halogeneous salt or compound of aluminium and an alkaline metal or alkaline earth metal, including a double fluoride of aluminium and an alkaline metal.

5,448/13. **Vapour Rectifiers.** B.T.-H. Co. (*G.E.Co., U.S.A.*). The rectifier claimed comprises communicating evacuated metallic chambers, one or more anodes in one of these and a mercury cathode in the adjoining chamber. There is a vacuum tight insulating seal between the chambers, at a point well removed from the cathode. A barrier of insulating material lines the cathode chamber, overlaps the seal, and encloses the active part of the cathode. The insulation is shielded from the direct heat of the arc by a wall of metal. Three figures.

6,143/13. **Incandescent Lamps.** H. ZSCHOCKE. Zig-zag metallic filaments are passed over non-conducting supporting arms, constructed preferably of glass or porcelain, and provided with a groove or with a grooved boss or head to receive the filament. These arms may be used at one end of the stem and metallic double spiral arms at the other. By this construction the filament is not bent too sharply. Six figures.

11,267/13. **Circuit Regulation.** SIEMENS DYNAMO WORKS (*Siemens-Schuckert*). There is used an auxiliary circuit in which a voltage may be varied down to zero, and when this voltage is approximately zero the connections of this circuit to the main circuit are bridged so that the reversal of the auxiliary pressure is facilitated. As an example, an A.C. circuit is fed by a transformer with tapplings, while there is also a tapped transformer in the auxiliary circuit combined with an induction regulator in series, giving a maximum pressure equal to that between two adjacent tapplings on the auxiliary transformer. The connections of the induction regulator are reversed, and at the same time connected with a further step of the auxiliary transformer. This and the induction regulator are reversed as a single unit. Four figures.

15,769/13. **Supplying Low-Pressure Current from High-Pressure Mains.** E. A. GRAHAM and W. J. RICKETS. A storage battery and breaking-down resistance are used. The battery charging circuit is closed through a relay controlled by another relay adapted to establish or remove a virtual short-circuit across it. The latter relay is controlled by the battery pressure and the former is arranged to have a bias in favour of positive action of the latter. The biasing may be obtained by a resistance normally in series with both relays, or a demagnetising winding may be arranged on the second relay. Five figures.

23,728/13. **Antennæ for Aeroplanes.** SIGNAL GRS. A bamboo mast is inserted into a steel tube built into the aeroplane frame near its centre of gravity. The upper end of the tube projects slightly above the wing planes. One figure.

## Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Dynamos, Motors and Transformers:** B.T.-H. Co. and WHITAKER [Regulation of rotary-converters] 26,899/12; [Amortisseur windings for synchronous machines] 9,685/13; Soc. S.T.A.R. (SYSTÈME DE TRACTION AUTO-RÉGULATEUR) 29,522/12; SIEMENS-SCHUCKERT. [Geared A.C. motors] 24,126/13.

**Electrochemistry:** DENNY [Ozone generators] 4,355/13.  
**Heating and Cooking:** RAILING and GARRARD, 29,763/12; IDE [Detachable immersion heater] 29,879/12.

**Ignition:** MAY [Igniters] 29,613/12; LAWRENCE [Ignition generators] 29,620/12.

**Incandescent Lamps:** TRENZEN [Making non-ductile metals ductile] 26,800/12.

**Storage Batteries:** HEAP and CHLORIDE ELEC. STORAGE Co., 29,456/12.

**Switchgear, Fuses and Fittings:** BAERLOCHER and ALLEN WEST & Co. [Working liquid controllers] 29,461/12; LUCAS and EDWARDS [Couplings for use in motor road vehicles] 29,809/12; RAUSCH [Time alarms] 4,638/13; HART and ANCHOR CABLE Co. [Earthing clips for metallic covered cables] 9,463/13; FAGERLUND [Switches] 13,654/13; HUTTON [Lighting indicator] 13,660/13.

**Telephony and Telegraphy:** SHEPARD and MCKECHNIE [Wireless] 21,743/12; AUTO. TELEPHONE MFG. Co. (*Auto. Elec. Co., U.S.A.*) [Telephone systems] 29,351/12, 29,352/12, 29,353/12, 29,354/12, 29,355/12, 29,356/12, 29,358/12, 29,359/12, and 29,360/12; ARNOLD [Method of reproducing electric variations] 29,384/12; BARONIO and WOOD [Telegraphic receivers for actuating perforators or typewriters] 29,416/12; SIEMENS BROS. and PRITTIGREW [Automatic switching apparatus connected over junction-lines with a manual exchange] 29,721/12; MARCONI Co. and GRAY [Masts for wireless] 24,148/13.

**Traction:** MASCHINENFABRIK OERLIKON [Switch and point operating mechanism] 15,062/13.

**Miscellaneous:** ELEC. HAMMERS, LTD., and SCOTT [Portable hammers for rivetting, caulking, &c.] 24,090/12; EVANS [Remote control of gun sights and guns, order telegraphs, &c.] 29,376/12; ROYER [Self-propelling torpedoes] 7,501/13; HEINS [Substitution resistances for lamps] 9,530/13 and 10,018/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** Soc. ANON. DES AUTOMOBILES AND CYCLES PEUGEOT [Safety apparatus for lighting installations] 21,445/13.

**Dynamos:** PEDERSEN [High frequency] 28,839/13.

**Electrometallurgy and Electrochemistry:** Soc. GEN. DES NITRURES [Manufacture of aluminium nitride] 21,366/13; [Furnaces for manufacture of aluminium nitride] 24,347/13; BRONN [Protecting the electrodes in arc furnaces] 29,259/13.

**Incandescent Lamps:** KLEIN [Lamp for advertisements or signalling] 29,284/13.

**Switchgear, Fuses and Fittings:** YOUNG [Fuses] 27,641/13.

**Telephony:** SIEMENS & HALSKE, 29,049/13 and 29,426/13; VAN KESTEREN [Repeater systems] 29,165/13.

**Miscellaneous:** MASCHINENFABRIK OERLIKON [Electro-hydraulic presses] 26,340/13.

## Appeal from Comptroller's Decision

8,040/12. **Variable Speed Dynamos.** C. A. VANDERVELL and A. H. MIDGLEY. An appeal has been lodged by the opposers from the Comptroller's decision to grant this patent.

## Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** S. R. EVANS [Incombustible sleeve fixed to flexible just above cord grip to prevent flame spreading upwards in the case of a short circuit in the socket] 21,308/06.

**Dynamos, Motors and Transformers:** A.E.G. [A.C. commutator motors] 18,372/08.

**Electrochemistry and Electrometallurgy:** G. J. ATKINS [Electrodes of carbon impregnated with oil] 21,021/02.

**Switchgear, Fuses and Fittings:** A. P. LUNDBERG, G. C. LUNDBERG, and P. A. LUNDBERG [Selective plugs: a pin in the socket engages a hole in split plug] 21,391/06.

**Telephony and Telegraphy:** A. M. BELLARD and M. C. RORTY [Automatic telephone exchange system] 20,739/02.

**Miscellaneous:** J. ZEITLIN [Multi-stage vacuum pump] 21,337/06; E. KLUPATHY and C. BERGER [Torpedoes] 19,825/08.



### HALF-WATT STREET LIGHTING AT EPSOM

JUST as we go to press the illustration below has come to hand. It is from a photograph taken by Messrs. Drake & Gorham on Tuesday night, showing the street at Epsom, which is lighted with four 2,000 c.p. half-watt lamps. With characteristic enterprise, Messrs. Drake & Gorham have



completed this in record time. The order was only given midday on Monday, the fittings were erected the same day, and the lamps were alight on Tuesday, and the block was sent to us by 10 o'clock yesterday morning.

### LOCAL NOTES

**Birmingham:** *Birmingham and Midland Institute Conversation.*—The Electric Supply Publicity Committee are exhibiting "The Electric House" at Birmingham during this week, at the Birmingham and Midland Institute Conversation. This exhibit is substantially a replica of that shown with such success at the recent Ideal Home Exhibition. The Birmingham Corporation Electricity Department, which is interested in this exhibit, is to be congratulated upon its enterprise, as Birmingham is the first provincial city in which it has been shown.

**Carnarvon:** *Free Wiring Agreements.*—A short time ago the Council took over from the National Electric Construction Co. the free wiring agreements in Carnarvon which that Company had entered into. A discussion took place at the last meeting of the Council upon a report from the Town Clerk dealing with these agreements, in the course of which it was stated that in the case of a large percentage of them there was very little, if any, income to meet the liability attached to them. A motion that no further agreements of this character be entered into was the subject of some divergent views, and eventually the whole question was referred back to the Electricity Committee.

**Chiswick:** *Proposed Purchase of Supply Co.*—The proposal of the Council to purchase the Chiswick Electricity Supply Corporation, Ltd., has been rejected by a ratepayers' meeting.

**Dumbarton:** *Bulk Supply.*—It is stated that the Clyde Valley Electrical Power Co. is entering into an arrangement with the Electric Supply Corporation, which distributes in Dumbarton, to give a bulk supply.

**London:** *Islington: Bulk Supply Scheme.*—Mr. A. Gay, Chief Electrical Engineer to the Council, who, we are pleased to hear, has now recovered from his long spell of ill-health, speaking at the Annual Dinner of the Council's electricity employees last week, expressed the hope that any alteration in the present arrangements of London supply, as foreshadowed by the proposed bill next session, would not be granted by Parliament. Mr. Gay and Mr. Macalister, his chief assistant, both believe that under present conditions, with a large number of power stations, London is more

immune from serious breakdowns in the supply of electrical energy than would be the case if there were only two or three large power stations. They both prefer that a linking-up scheme between the existing districts should be developed rather than that a big company should be allowed to take over the supply to the whole of London.

**St. Pancras.**—In reporting upon the possibilities contained in the County of London Electric Supply Co.'s Bill, the Borough Electrical Engineer states that, provided any "bulk" supply offer is based on correct data and similar conditions as to load, coal value, repayment of capital, &c., the St. Pancras power stations can yield as good or even better results than any power station likely to be erected by a company, inasmuch as the demand in St. Pancras is sufficiently extensive to enable the employment of as large generating sets as could be used elsewhere. The total cost of production under the Council's scheme (referred to in our "Tenders Invited" column) is 0.3962d. per unit, including capital charges, on an output of 14,500,000 units.

**Manchester:** *Purchase of Trafford Park Co.*—A deputation from the Manchester Ratepayers' Association waited upon the Lord Mayor last week to protest against the purchase of the Trafford Power & Light Supply Co., Ltd., which, as we have already announced, the Council take powers to do under its bill next session. The reason for the objection is that the Supply Co. is not a paying concern, and that, although the capital powers asked for by the Corporation in connection with this scheme only amount to £250,000, it is believed that something like £1,000,000 will be necessary eventually.

**Monmouth:** *Proposed Sale of Electricity Undertaking.*—During the discussion upon the position of the electricity undertaking last week, when it was decided to borrow £1,800 for mains extensions (see "Tenders Invited" column), a resolution was moved that the undertaking should be sold. Only the mover and seconder, however, voted in favour.

**Penmaenmawr:** *Electric Lighting.*—The North Wales Power and Traction Co. has offered to supply the Council with current in "bulk" on a seven years' contract, at the rate of 1½d. per unit up to 24,000 units per annum, and 1d. per unit for all beyond that quantity. The minimum payment for the first two years, it is suggested, should be £120, and £150 for the remaining five years.

**Pwllheli:** *Electric Supply.*—The Council has approached the North Wales Power and Traction Co. with a view to instituting a supply of electrical energy in that town.

**Redditch:** *Proposed Sale of Electricity Undertaking.*—A request from the Ratepayers' Association to call a town's meeting or take a poll in order to ascertain opinions as to the desirability of selling the electricity undertaking, has been referred to the Electricity Committee.

**Swansea:** *Supply for Electric Vehicles.*—The Borough Electrical Engineer has been instructed to report on the question of supplying electrical energy for electric vehicles.

**Whitstable:** *Electric Supply.*—The new Whitstable Electric Supply Co. expect to be in a position to give a supply of current in five or six weeks time. Practically all the capital has been subscribed locally.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £65 10s. to £66 (last week, £67 to £67 10s.).

**Agency.**—An agent in St. Malo (France) desires to obtain the representation of United Kingdom manufacturers of electrical plant. Further particulars at 73 Basinghall Street, E.C.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**German Edison Accumulator Co.**—The Akkumulatorenfabrik, Akt. Ges., Berlin-Hagen, have purchased the undertaking of the German Edison Accumulator Company for a sum of £62,500, equal to half the paid-up capital of the latter company.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 369 [VOL. X., No. 4]  
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THURSDAY, JANUARY 22, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

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*Other Advertisement Rates on Application.*

### Latest Time for Receiving

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Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5508 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY


A BRIEF *résumé* is given of the arrangements made on January 1st for the taking over by the Compagnie Parisienne de Distribution d'Electricité of the six companies supplying electricity in Paris. The maximum price of current for lighting per hectowatt-hour has been reduced from 7 centimes to 5 centimes. (Page 44.)

A LONG-BURNING flame-arc lamp, in which the upper electrode is a piece of untreated carbon 2 in. by 2½ in., is being put on the market in America. It burns for 200 hours per trim. (Page 44.)

We give the terms of the new working rules suggested by the Electrical Trades Union which are intended to come into force on January 24th. If the masters maintain their firm attitude, however, no serious strike is likely to occur. The electrical wiring trade is also likely to be seriously affected by the lock-out in the building trade threatened on Saturday. (Page 45.)

THE use of the lead covering of three-phase power cables for single-phase lighting is dealt with in our Questions and Answers column. (Page 46.)

In his Address as Chairman of the "Point Fives," on Friday last, Mr. A. H. Seabrook explained his conversion from the "connected load" to the "rateable value" system for fixing the primary charge for resi-

 **BINDING "ELECTRICAL ENGINEERING."**—Vol. IX. of "Electrical Engineering" (Jan.—Dec. 1913) closed with our issue of December 25th, 1913. Readers can have their volumes bound by their own bookbinder; or, they may send their numbers to THE KILOWATT PUBLISHING CO., LTD., Temple Chambers, London, E.C., carriage paid (with the reader's name and address), and a remittance of 4s. 6d. under separate cover. The volumes will then be bound and returned carriage paid to any address in the United Kingdom, or carriage forward to the Colonies or abroad. Binding Cases (including index, but not including binding) 2s. each, or post free 2s. 4d. (Abroad 2s. 6d.) Index alone, 1d. (Post free 2d.).

dence electricity supply. By choosing a suitable percentage on the rateable value, this system can be used for any class of property, still keeping the secondary charge at ½d. per unit for all purposes. If unable to charge ½d. per unit for heating and cooking when this is the competitive market price, it is better, said Mr. Seabrook, to charge 3d. and keep off the business. (Page 46.)

We publish further letters from supply station engineers in various parts of the country with regard to the prospects of the half-watt lamp in their districts. The general tone is one of warm welcome; there will soon be very little use now for incandescent gas lighting for large shop front lanterns or for street lighting. A few of our correspondents, however, are nervous as to the cost of renewals for the latter purpose, and hope for cheaper lamps. (Page 47.)

THE important subject of overhead line construction for medium and low pressures was dealt with by Mr. A. P. Trotter in a Paper before the Institution of Post Office Engineers. The author illustrated the guard devices which have been developed by the electrical engineers of Dudley, Sale, Accrington, and Rawtenstall. In all cases earthed cross-wires or their equivalent are provided. (Page 49.)

A PATENT for carbon switch contacts in the name of A. Reichwald expires during the week after a full life of 14 years.—Among the specifications published last week is one by C. Trenzen for the manufacture of ductile tungsten for drawn incandescent lamp filaments. Another relates to liquid controllers, in which the height of liquid is kept constant. This is by R. F. Baerlocher and Allen West & Co. (Page 51.)

THE London County Council has decided to accept the recommendations of the Select Committee of the House of Commons on Traffic with regard to a new traffic authority for London.—We describe the train lighting system of the Tudor Accumulator Co.—Petrol-driven trams are being experimented with on the Hastings sea front in substitution for the Dolter surface-contact system. (Page 50.)

ON vessels making international voyages of over 150 miles, and carrying 50 persons or more, wireless in-

stallations are to be compulsory. These and other regulations have been made by the International Conference on Safety of Life at Sea. Continuous watches are also to be kept in the wireless telegraph rooms of larger vessels. (Page 50.)

A NEW fitting for "half-watt" lamps, a substantial stage lighting plug, an illuminated hoarding, some new types of drawn tungsten wire battery lamps, and a central suspension lighting arrangement using trolley poles, are among the new appliances dealt with on pages 52 to 54.

New plant is required at Dorking (£2,000); Paarl, S.A. (£35,000); and Loughborough (£14,000).—Mains extensions are contemplated at Wolverhampton (£450); electrical supplies at Leeds and Birmingham; voltage control apparatus at Hackney; and laundry machinery at Dundalk.—Considerable discussion has arisen on the recommendation of the Bradford Electricity Committee that the tender of a Berlin firm for a 5,000 kw. turbo-alternator be accepted. (Page 54.)

THE Edinburgh Electricity Committee desires to increase its reserve fund to 15 per cent. of the capital expenditure.—The 9,000-kw. Lake Coleridge power plant (N.Z.) has been started up.—The Carlisle Electricity Committee resents a proposition by the Gas Committee that there should be no competition in the matter of price.—The London Borough Councils are proposing to oppose the County of London Electric Supply Company's Bill collectively.—A new 2,000-kw. turbo-alternator has been started up at Worcester. (Page 56.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JANUARY 22ND.

*Institution of Electrical Engineers.*

8 p.m. Fifth Kelvin Lecture by Sir Oliver Lodge, F.R.S., "The Electrification of the Atmosphere."

FRIDAY, JANUARY 23RD.

*Physical Society.*

5 p.m. At Imperial College of Science. The Agenda includes an Exhibition of a Water Model of the Musical Arc by W. Duddell, F.R.S.

MONDAY, JANUARY 26TH.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College of Science. "Reactance and Reactance Coils in Power Circuits," by E. P. Hollis.

TUESDAY, JANUARY 27TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At University. "Electric Train Lighting Systems," by T. Ferguson.

WEDNESDAY, JANUARY 28TH.

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At University. "Electric Train Lighting Systems," by T. Ferguson.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. "Recent Advances in Portable Wireless Telegraph Apparatus," with Demonstrations by P. R. Coursey.

FRIDAY, JANUARY 30TH.

*Institution of Electrical Engineers: Newcastle Section.*

7 p.m. At Hugh Bell School, Middlesbrough. "Reactance and Reactance Coils in Power Circuits," by E. P. Hollis.

## The London Electrical Engineers.

(TO-DAY) THURSDAY, JAN. 22ND.—C. Company. Technical Instruction 7 to 10 p.m.

FRIDAY, JAN. 23RD.—D. Company. Technical Instruction, 7.30 to 9.30 p.m.

SATURDAY, JAN. 24TH.—Headquarters open from 10 a.m. till noon

MONDAY, JAN. 26TH.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, JAN. 27TH.—B. Company. Technical Instruction, 7 to 10 p.m.

WEDNESDAY, JAN. 28TH.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m.

THURSDAY, JAN. 29TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, JAN. 30TH.—D. Company. Special Class on Crossley Engine, 7 to 8 p.m. Technical Instruction, 7.30 to 9.30 p.m.

SATURDAY, JAN. 31ST.—Headquarters open from 10 a.m. till noon.

## CONSOLIDATION OF ELECTRIC SUPPLY IN PARIS

IN view of the prominence that has been given of late to the question of consolidating London's electric supply, it is interesting to record that on January 1st the consolidation of the supply of Paris under one authority, named the Compagnie Parisienne de Distribution d'Electricité, was actually effected by this Company taking over the undertakings formerly owned by the following six Companies:—La Compagnie Electrique du Secteur de la Rive Gauche de Paris, La Compagnie Parisienne de l'Air comprimé, La Société d'Eclairage électrique du Secteur de la place Clichy, La Compagnie d'Eclairage électrique du Secteur des Champs-Elysées, La Compagnie continentale Edison, and La Société d'Eclairage et de Force par l'électricité à Paris. Each of the Companies supplied an area known as a "secteur," and various systems of distribution were employed. Their original concessions were granted in 1889, and expired in 1907, when the Municipal Council of Paris drew up a new scheme extending the concessions till 1940, and decreeing that the present new Company should take them all over this year. The old Companies had to pay a royalty of £120,000 per annum, and the royalty to be paid by the new Company may be considerably increased above this figure if more than a 6 per cent. dividend is earned. In 1940 the whole of the stations and distributing systems will become the property of the Municipality without any payment. During the interval between 1907 and this year the supply has been jointly managed by the Comité de l'Union des Secteurs, and the shutting down and conversion into substations of the old generating stations has been proceeded with to prepare for the ultimate idea of supply from two or three large stations. The arrangement of the substations and zones of distribution was fully described in *ELECTRICAL ENGINEERING*, Vol. V., p. 719 (August 12th, 1909). At present the city is divided into four zones, supplied respectively on the three-wire continuous, five-wire continuous, single-phase and two-phase systems, and the bulk of the supply is taken from the huge St. Denis station, the "Triphasé" station at Asnières, and the station Issy-les-Moulineux. Some particulars of the first two of these were given in *ELECTRICAL ENGINEERING*, Vol. IX., p. 303, May 29th, 1913. An immediate effect of the change over is the announcement that the maximum price of current for lighting per hectowatt-hour is reduced from 7 centimes to 5 centimes.

## NEW LONG-BURNING FLAME-ARC

THE Electro Development Co., of New York, is putting on the market a long-burning enclosed flame-arc lamp, which, it is stated, will run for 200 hours on a single trim. According to the *Electrical World* of New York, the floating feed mechanism is controlled by a single series solenoid, which advances the lower electrode, a 9-in. by 1-in. treated carbon. The upper electrode is a 2-in. by 2½-in. piece of untreated carbon, and for D.C. operation is connected to the negative side of the line. A ratchet has been arranged to revolve this electrode as the side on which the arc is burning becomes lower than the surrounding parts. No economisers or blow magnets are used. The size of the upper electrode keeps the arc in nearly the same horizontal plane throughout its life, which is between 400 and 600 hours, so that the lamp is really of the focussing type, although without focussing apparatus. It is declared that the lamp will operate without flicker throughout each entire trim.

On D.C. circuits the lamp requires 5 amperes with 80 volts at the arc, while the A.C. lamp takes 7 amperes with 78 volts at the arc. Series lamps of this type are also manufactured. All of these lamps are equipped with a condensing chamber of solid copper having a gun-metal outside finish.

"Old Centralians' Magazine."—The current issue of this publication contains a valuable contribution from Dr. S. P. Smith, in which the theory and behaviour of the three-phase commutator motor is lucidly set forth. This type of motor lends itself admirably to speed control, but is of somewhat high cost. A contribution entitled "Ambitions: Commercial and Technical," from an anonymous author, compels attention on account of the way in which poignant facts are presented in a humorous manner. Mr. J. T. Irwin contributes a short article on his recent work on sound, using a very thin, tightly-stretched diaphragm of high natural frequency, so that direct records of the sound waves in air produced by the voice may be obtained. A *résumé* of the work of the City and Guilds (Engineering) College during last session is given, as well as copious Old Students' notes.

## THREATENED STRIKE OF ELECTRICAL WORKERS Union's "Ultimatum"

WE recorded in our issue of January 8th (p. 16) that the negotiations between the London Electrical Masters' Association and the Electrical Trades Union had been broken off, and that the Masters' Association had called a union and non-union meeting for Tuesday next (January 27th). The Electrical Trades Union has now issued its new Working Rules Card as an ultimatum. This has been sent around to all the London employers with the following covering letter:—

DEAR SIR,—Adverting to our letter of November 11th last, in which an application for an advance of wages to electrical grades was made, and in which we stated we were prepared to discuss this question with a body representative of the employers, we have received a communication from the Committee of the newly-formed London Electrical Masters' Association refusing to negotiate.

The Masters' Association was brought into being on December 3rd at a meeting of the employers as a result of the above application. A Committee was there appointed, with, we understand, definite instructions to meet representatives of the Trade Union. We have been and are prepared to meet a body representative of the employers to deal with any points at issue, providing the questions are discussed on their merits, without any previous conditions being exacted by either side. This decision we have communicated to the Committee of the London Electrical Masters' Association. Apparently at the bidding of a small caucus they have refused to accept these perfectly fair terms, without even consulting the opinions of the general body of employers.

A number of contractors and others have already conceded the rates we ask; a still larger number have written that they thought our claims justified. In the circumstances we have no alternative, representing as we do by far the larger section of the skilled workers in the industry, and having waited two months, but to issue the enclosed Working Rules Card, which will become operative on and after Saturday, January 24th, 1914.

Trusting we shall hear from you that the new terms have received your favourable consideration.

I remain, on behalf of the London District Committee,  
Yours faithfully,

J. POTTER,  
District Secretary.

We set out below in full the new Working Rules Card:—

### ELECTRICAL TRADES UNION.

#### LONDON DISTRICT WORKING RULES.

1. These Rules shall apply to all contractors, sub-contractors, and their workmen.

2. Fifty hours shall constitute a week's work (excepting shift men), but when members are working on jobs where the hours are less, the money shall be made up to equal 50 hours a week. Nine hours shall constitute a day's work for the first five days of the week, and five hours on Saturday.

3. Overtime worked on the first five days of the week to be paid for at the rate of time and a half for the first four hours, and double time after till starting-time next morning. If the work continues after 12 midnight, the member shall be paid up to starting-time next morning. Half an hour shall be allowed for tea, and one hour for supper if working after 12 midnight.

All overtime worked on Saturday and Sunday till starting-time on Monday morning to be paid for at the rate of double time.

Each day to stand by itself.

No member shall be allowed to work more than one night in succession, viz., that after working one night members must cease work at the usual time of leaving work next day.

No member shall be allowed to work overtime, unless absolutely necessary, when members in the district are unemployed.

4. Night-shift work to be paid for at the rate of time and a half, all time worked after nine hours to be paid for at the rate of double time.

#### Rates of Wages.

5. The minimum rates of pay shall be in accordance with the following scale:—

"Electrical Fitter and Wiremen" ...	11d. per hour.
Armature Winders ...	11d. per hour.
Cable Joiners ...	11d. per hour.
Plumber Joiners ...	1s. per hour.
"Joiners'" Mates ...	8½d. per hour.
Meter Fixers ...	£2 per week.
Coil or Magnet Winders ...	9½d. per hour.

All Charge Hands to receive a minimum of 1d. per hour extra.

Shift Engineers ...	£3 0 0 per week.
Switchboard Attendants ...	£2 5 0 per week.
Accumulator Erectors and Attendants ...	£2 5 0 per week.
Power and Dynamo Attendants ...	£2 5 0 per week.
Arc Lamp Trimmers ...	£1 18 0 per week.

The total number of hours worked shall not exceed 56 per week.

6. All members (except inside workers) working over one and less than twelve miles from shop, to be allowed travelling time and third class ordinary railway fares. Country expenses to be not less than 2s. 6d. per day in England, and not less than 3s. per day in Scotland or Ireland. Travelling time and third class railway fares to be paid for the journey from shop to job, and from job to shop.

Inside workers shall be allowed walking time for any distance under one mile, and not less than one shilling per day for over one mile and under three miles from shop. Not less than 1s. 6d. per day outdoor money be paid, and travelling time and third class ordinary railway fares allowed for any distance over three miles and under twelve miles from shop.

7. All members working on any dirty job must receive not less than one shilling per day extra. All members working on any dangerous jobs must receive 2s. 6d. per day in addition to outdoor money.

Members sent to work on jobs on the Continent of Europe must receive not less than 1s. 3d. per hour, in addition to £1 10s. expenses.

8. District holidays to be: Easter Monday, Whit Monday, August Bank Holiday, Christmas Day, and Boxing Day. No holiday shall entail more than two days' loss of time. The rate of pay for Bank Holidays shall not be less than time and a half, Christmas Day and Sundays not less than double time.

9. Payment of wages shall commence as soon as practicable after the time of leaving off, and be paid on the job or place of employment; but if otherwise arranged, walking time at the rate of three miles per hour shall be allowed to get to the pay table. Any workman kept waiting for his wages beyond twenty minutes to receive time and a half for all time kept waiting from the time of leaving off work. Not more than one day's wages shall be kept in hand as back time.

10. One hour's notice to be given on either side on determining an engagement. All wages due to be paid at the expiration of such notice, or walking time if sent to shop. Weekly employees to give and receive one week's notice. Members running casing to receive one hour's grinding money in addition to one hour's notice.

11. Employers shall provide where practicable and reasonable the following conveniences:—

(a) A suitable place for the workmen to have their meals on the works, with a labourer to assist in preparing them.

(b) A lock-up where tools can be left.

(c) A grindstone for the use of workmen.

(d) The provision of proper sanitary accommodation.

12. Sub-letting for labour only to be prohibited.

13. The term "London District" to mean a twelve-mile radius from Charing Cross.

14. All members working in shops where the conditions are better than this card demands must uphold the established conditions of the shop.

The District Secretary of the Union contends that the Committee of the London Electrical Masters' Association is not representative of the electrical industry in the metropolis, and that the notice issued by them is "a departure from all accepted principles of negotiating with a workmen's association on questions relating to wages and working conditions."

In looking through the new Working Rules Card we notice that no attempt has been made to provide for any of the lower grades of workmen except "joiners'" mates, which is presumably a misprint for "jointers'" mates. It is also noteworthy that the rules are said to apply to all contractors and sub-contractors, and yet the proposed new rates of wages include shift engineers, switchboard attendants, power and dynamo attendants, and arc lamp trimmers, few of whom can be employed by contractors, and practically none are members of the Union. We understand that the London Electrical Masters' Association will meet to-day to discuss what action they will take.

Not without interest is the position in the building trade, as it is the "sympathetic" action of many of the branches of this trade which has helped the Electrical Trades Union, and has resulted in the withdrawal of the London Master Builders' Association from their agreements with most of the building trade unions. Last Saturday all members of the London Master Builders' Association informed all their employees (except mill sawyers and wood-cutting machinists, smiths and fitters, plumbers, and crane-drivers) that they must sign a guarantee by next Saturday that they will not quit their employment because any fellow employee is or is not a member of a trades union. This, it is believed, a large majority of the men will be sufficiently ill-advised to refuse, and unfortunately there is every likelihood of a big lock-out in the building trade in a few days.

**San Francisco International Electrical Congress.**—Plans are already well under way for the provision of special trains from the East to San Francisco in connection with the International Electrical Congress to be held there in September 1915. A 30-day excursion, embracing Chicago, Colorado Springs, Salt Lake City, San Francisco, Santa Barbara, and Los Angeles, as well as other places of interest, is also being arranged. The secretary is Mr. Preston S. Millar, 80th Street, New York.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,375.

Give particulars of any rules or curves showing the power lost (in watts) in ring lubricated brass bearings, compared with the power lost in ball bearings suitable for the same load and speed. Compare also the probable life of the above two types of bearings. If possible tabulate the minimum number of balls per bearing and diameter of each ball and ball race, against maximum load per bearing and maximum safe speed of the inner ball race for both ball and thrust bearings. Is the true spherical, or elliptical, shape of ball race the most reliable? When is it advisable to depart from ball to roller bearings?—"F."

(Replies must be received not later than first post, Thursday, January 29th.)

### ANSWERS TO No. 1,373.

It is proposed to use the lead covering of three-phase, three-core power cables (which are laid solid in bitumen) for single-phase lighting at 260 volts. The three phases would be practically balanced, and the wiring for lights would be single lead covered. The machines are 450 volts, 50 cycles, with neutral and cables earthed at power station. The lead covering at the end of each cable is used for earthing. The longest length of cable is about 450 yards. What are the chief points to bear in mind on such a scheme? Would it be an advantage to earth each cable at the far end?—"PHASE."

The first award (10s.) is made to "A. G. R." for the following reply:—

In reply to "Phase's" query, I would point out, in the first instance, that in this country the Board of Trade Regulations call for the efficient earthing of the lead sheathing of all main cables at one point only, viz., at the generating station. Therefore "Phase" must not earth his cables at the far ends. Also, as this fourth wire of his system is to be used for lighting, and is earthed, the generator neutral points must be connected to it, and the system becomes a three-phase with earthed neutral; in one way this will be an advantage, as the three mains are now only at a potential of 260 volts above earth. As the wiring for the lighting circuits is to consist of single-core lead-covered cables, care must be taken to connect efficiently this lead covering to the lead covering of the main three-phase cables, and to make sure that it is electrically continuous throughout. These single-core cables must not be earthed, as the lead sheathing of the main cables is earthed at the station. The lead being practically balanced, the total current through the lead return will be comparatively small, but care must be taken to ensure that the current density does not reach an excessive amount, or cause the lead to heat up. If the cables are by any chance armoured, the armouring will be earthed at the station, and will also be in parallel with the lead sheathing, thus increasing the conductivity of the neutral return, which will be a great advantage. No switches, fuses, or protective gear are required in the earthed main.

No reply worthy of a second award has been received.

## THE RATEABLE VALUE RESIDENCE TARIFF

MR. A. H. SEABROOK'S Address as Chairman of the "Point Fives," on Friday last, dealt with tariffs. He commenced by saying that, although in his Paper on "Residence Tariffs," before the Institution of Electrical Engineers on December 14th, 1911 (ELECTRICAL ENGINEERING, Dec. 21st, 1911, p. 693, Vol. VII.), he had adversely criticised the rateable value system of charging, careful investigation had convinced him that the system is superior to all other bases of primary charge, with the proviso that where the price of gas is not more than 2s. 6d. per 1,000 cub. ft., the secondary rate should not exceed  $\frac{1}{4}$ d. per unit. Electricity at 6d. per unit, flat rate, could compete with gas at this price. Among the many advantages of this system, he mentioned that it was adaptable to an almost universal application, because any percentage of the rateable value could be taken without affecting the principle, while the actual energy could in nearly every case be supplied at  $\frac{1}{4}$ d. per unit. In this case improvements in the efficiency of lamps did not affect the revenue to nearly the same extent as in the case of the connected load basis, maximum demand or flat rate. It was possible to regard the rateable value system in two ways. First, to calculate the primary charge so that it covered investment costs and standing charges of the complete electric service to a residence, and that the secondary rate of  $\frac{1}{4}$ d. represented the running costs, plus profit, of the units sold. Secondly, the primary charge, plus a few units at  $\frac{1}{4}$ d., could be regarded as the charge for lighting the residence, and the secondary regarded as the charge for additional business for other uses than lighting. The objection that this was unfair he regarded as merely sentimental, and had no foundation beyond the fact that it enabled a consumer who would not use electricity for heating and cooking on account of "sheer cussedness, or some other consumerlike reason," to complain that he was paying more for his lighting than it cost the undertaking, plus reasonable profit. But if the supply authority were debarred from charging a high lighting rate, by being allowed to put standing charges to it, it could not offer a sufficiently low rate to get the heating and cooking load as "additional business." The railway companies, who had had more experience in rate-making than Electricity Supply Authorities, were confronted with a similar problem, and out of their experience they found that they could charge exceedingly low rates to temporary visitors for season tickets between seaside resorts and the big towns, who might otherwise not be encouraged to indulge in a holiday broken up by frequent journeys to town. The various objections to the "rateable value" system which have been advanced from time to time could all be met, the author showed, by remembering the recognised principle in rating that "those who can pay shall pay."

The following passage of the Address is important and worthy of serious consideration:—

"We really must make up our minds to observe the fundamental law of business, which is that the selling price of a commodity is what it will fetch in the open market; if we fix a price above this we will do only a small restricted business. If we fix upon the market price, our sales and profits will depend upon the efficiency of our organisations and selling staffs. If we are unable to make up our minds to charge  $\frac{1}{4}$ d. per unit when that figure is the competitive market price for electricity used for cooking and heating, it is far better to fix, say, 3d., and keep off the business until we are really prepared to regard it as a serious item of income."

### British Electrical and Allied Manufacturers' Association.—

At the Council Meeting of the Association held at King's House, Kingsway, on the 15th inst., the following firms were elected members of the Association: Bray, Markham & Reiss, Ltd.; W. T. Glover & Co., Ltd.; and Siemens Bros. & Co., Ltd.

**Overhead Power Lines.**—The first sentence of the second column of our report of Mr. Welbourn's Paper on this subject, on page 35 of our last issue, should read: "The author advised the use of aluminium in preference to copper when the cost of the former gives the cheaper line, especially where the air is laden with sulphurous products."

**Power Railway Signalling.**—At the Students' Meeting of the Institution of Civil Engineers, held on January 9th, Mr. C. I. Routh read a Paper entitled "The Application of Power Railway Signalling in Great Britain." The chair was taken by Mr. A. W. Szlumper, who said that power signalling was still at an experimental stage in Great Britain, and he strongly advised young engineers who are in any way interested in this branch of engineering to take it up thoroughly, as he considered it had a great future before it.

## PROSPECTS OF THE HALF-WATT LAMP

**B**ELOW are further letters received from Supply Station Engineers in various parts of the country, in reply to our inquiry as to the prospects of the half-watt lamp in their districts:—

**MAIDSTONE.**—MR. E. E. HOADLEY sees a good use for the 1,000-c.p. lamp to replace groups of ordinary tungsten lamps in street lanterns where the old co-axial arc lamps had previously been employed. He also sees a good market for this size of lamp and the 500-c.p. lamp for outside shop lighting.

**LOWESTOFT.**—MR. W. R. MAY writes: If we can be practically sure of getting about 900 hours of burning, it will be invaluable for street and outside shop lighting, as it will, especially in the 2,000 and 1,000 c.p. sizes, compare very favourably with flame arc lighting.

**ST. ANNE'S-ON-SEA.**—MR. J. H. CLOTHIER does not anticipate any large demand for half-watt lamps in his town, as the public lighting is practically all by electricity with 100-c.p. lamps.

**BEXLEY.**—MR. H. P. STOKES says that the lamps will provide a very powerful weapon in competing with high-pressure gas.

**DONCASTER.**—MR. E. S. RAYNER writes: It is the one thing needed to compete with the outside gas lighting of shops, and I think it will be a very great rival to the arc lamp, as all incidental expenses of trimming, &c., are absent.

**BRAY.**—MR. W. J. U. SOWTER writes: Some time since, we replaced all our open type arc lamps by tungsten 600-watt lamps, and the change has proved most beneficial. No doubt we shall try the half-watt lamp, and its success will depend to a large degree upon its initial cost and useful life. Current for street lighting can be generated so cheaply, however, that economy of consumption is not of very great importance, and it may be advantageous to continue the use of the less efficient lamp.

**CHESTERFIELD.**—MR. R. L. ACLAND says that the large units will be of great assistance for street lighting, and as the lamp gets down to the lower candle-powers, the electricity v. gas question will be finally solved.

**WREXHAM.**—MR. W. G. PICKVANCE replaced his arc lamps with high candle-power tungsten lamps two or three years ago, and for the last four years has supplied consumers' outdoor arc lighting at 3d. per unit, including carboning and maintenance. He anticipates using half-watt lamps for both these purposes, but thinks that tariffs for tradesmen's premises should be considered at an early date before the half-watt lamp appears in small candle-powers, and that some charge such as the telephone rate should replace the flat rate.

**ISLE-OF-THANET.**—MR. J. A. FORDE anticipates that the lamp will eventually be manufactured in smaller candle-powers, and regards its advent with mixed feelings.

**TAUNTON.**—MR. A. J. HOWARD writes: They will enable us to compete with high-pressure gas on more than equal terms, and also to effect great economies in street lighting which will more than off-set any decrease in current consumption by private consumers.

**TORQUAY.**—MR. C. W. SALT says that the large high-efficiency lamp will be much welcomed in his town, especially for street lighting and shop window lighting.

**FOLKESTONE.**—MR. T. HESKETH says that the metal filament lamp certainly retarded the rate of progression at Folkestone, but by no means stopped his Company's progress. Experience has since shown that the change from 4 watts to 1 watt has proved one of their best friends, and he can only think that the change from 1 watt to  $\frac{1}{2}$  watt will be equally beneficial.

**GRANTHAM.**—MR. J. E. EDMUNDSON hopes to see the lamp in smaller sizes soon. The metal filament lamp caused the revenue of his undertaking at first to drop, but has now enabled business to be obtained which they could not get before. He thinks that the contract system of charging must soon replace a flat rate by meter alone.

**KETTERING.**—MR. W. A. WALKER says that large candle-powers on 200 volts D.C. would restrict the use of the lamps to street lighting, and he considers the flame lamp superior to the metal filament lamp for this purpose. Practically all the boot factories in his town, however, use arc lamps for lighting their workshops, and these are not very satisfactory, and their replacement by half-watt lamps will have the additional advantage of reducing the unremunerative peak load.

**STRATFORD-ON-AVON.**—MR. J. G. THAIN writes: It is the counter-stroke to the high-pressure gas system.

**GLOUCESTER.**—MR. F. H. CORSON says there can be no question of the value of the half-watt lamp as an important aid to the supersession of older methods of lighting. His welcome to small sizes would be less enthusiastic, as his department is still largely dependent upon lighting sales.

**MERTHYR TYDFIL.**—MR. D. W. DIXON thinks he can do much good with the high c.p. lamps in the district, as a good reply to the recent keen competition of gas. As tradesmen will not go to the expense of lanterns and lamps, a suitable tariff depending upon the hours of burning per annum has been arranged, and has become very popular.

**BOLTON.**—MR. W. J. H. WOOD anticipates there will be a large market for the lamp in a manufacturing town such as Bolton, where it should be extensively used for workshop lighting to replace arc lamps, and save trimming, cleaning, &c. The same, he says, will apply to street lighting and shop-window lighting. Generally he thinks that reduced current consumption will be compensated for by the more general use of electricity among manufacturers.

**HEYWOOD.**—MR. R. B. LEACH thinks the new lamp will be a tremendous asset to the electrical industry, and so make gas competition for lighting purposes more a thing of the past, especially when the lamps are made in smaller c.p. sizes. He thinks tariffs should not be increased except in very special cases.

**NORTHAMPTON.**—MR. G. H. JACKSON thinks the half-watt lamp will be very serviceable for many purposes in that town, both to compete with high-pressure gas and probably to replace some arc lamps. He hopes for lower candle powers for high voltage, and lower prices.

**SOUTH SHIELDS.**—MR. H. S. ELLIS says that the 1'1 to 1'25 watt lamp has not enabled him to make any headway against high-pressure gas, and those who had these lamps have only kept them on his convincing them that the half-watt lamp would be on the market before long. He is handicapped in competition with high-pressure gas by not being able to sell or hire electrical fittings, and believes that, in some cases, five-year agreements have been made by the Gas Company. He points out, however, that the low first cost for installing the half-watt lamp will be of assistance.

**STAFFORD.**—MR. W. H. ROBINS states that the Gas Department hire 750 c.p. high-pressure gas lamps at £3 15s. per annum, including gas, repairs, and maintenance. The development of arc lamps has also been impeded by the necessity for running two enclosed, or four open or flame type arcs in series. When the new lamp is sold at a lower price he says its success should be assured, but on the present life the cost of the lamp alone works out at 0'75d. per hour's burning for a 200-260 volt lamp.

**ECCLES.**—MR. H. W. ANGUS writes:—If the makers' claims be substantiated, I think these lamps should quickly dispose of most of the arc lamps in this town, and enable us to successfully compete for all classes of outdoor lighting. He trusts smaller sizes of half-watt lamp for general indoor light will come very gradually in the market, as he does not view with equanimity a further reduction in the revenue from lighting consumers.

**WARRINGTON.**—MR. F. V. L. MATHIAS says that the price of the lamps and the fact that at ordinary pressures about 2,000 c.p. is the least that can be installed will tend to restrict their employment, but he thinks that they may be used for illuminating large areas, and possibly, in the 300-watt size, for lighting shop-fronts.

**HARROW.**—MR. J. A. B. HORSLEY says that the Nernst, Gem, Tantalum, and Tungsten lamp has each in turn had a push from him into the arms of the consumer, and half-watt lamps will be burning in Harrow just as soon as he can get them.

**CHICHESTER.**—MR. R. V. WEARE states that the new lamp will be of the greatest value for the effective illumination of large interiors and street lighting.

**NORWICH.**—MR. F. M. LONG thinks that the lamps will prove a benefit to electrical undertakings in competition with gas, but in the present large candle-powers does not see much scope for them except in replacing arc lamps. He thinks that when they can be produced in 100-watt sizes they will be of very great value in enabling the standard of public lighting to be vastly improved. With a tariff consisting of a fixed charge and 1d. per unit, he looks forward with unconcern to the introduction of these lamps in the smallest sizes.

**UXBRIDGE AND DISTRICT.**—MR. A. R. BELL, whose district covers 80 square miles, sometimes wonders whether, with a one-watt lamp, electricity supply for lighting is a commercial proposition even at 7d. or 8d. per unit. He is glad that the high candle-powers will at present keep the half-watt lamp away from private houses and the interior of shop windows. There would otherwise be a liability of the lamp being used in improperly-ventilated fittings in positions where this would be dangerous.

**KING'S LYNN.**—MR. C. W. JACKSON obtains a life of 2,500 hours with one-watt lamps, so that the cost of renewals works out for a 2,000-c.p. lamp to 0'54d. for the half-watt and 0'33d. for the one-watt. This takes away 0'21d. from the cost of the unit saved, and the danger of trouble from extinctions, which is important with posts of such high candle-power in a small town, is enhanced. For shop-window and factory lighting he thinks they will be useful to a certain extent.

**WORTHING.**—MR. G. PORTER writes: It will enable us to compete on at least equal terms with the high c.p. high- and low-pressure gas lamp, and to offer contract terms to local authorities based on figures that are not of necessity severely "cut." The half-watt lamp also offers a much simpler solution of the street lighting problem than does the series arc lighting system, with its miles of cable and numerous automatic devices. There is an extensive series flame arc lamp system here in Worthing.

Its supersession by half-watt lamps, each one treated as an independent service, will save the ratepayers certainly two-thirds of the present charges for maintenance and upkeep. A flexible group switching and subdivision of lighting units will not be difficult to contrive. The blessing will not be so unmixed when the domestic half-watt lamp is put on the market. It is now more than ever essential for undertakings to augment their reserve and suspense funds to meet the contingency when it arises, and to bring their generating plants fully up to date. Obsolete engines and boilers, no longer used, but still representing annual payments of principal and interest, will have to be written off, and live plant installed in their place.

**MEXBOROUGH AND SWINTON.**—MR. P. PRIESTLY has already fixed a good number of one-watt 600 c.p. lamps outside business premises, and, having in view the satisfaction they have given, he is confident that the half-watt lamp will prove a success.

**NEWCASTLE-UNDER-LYME.**—MR. A. J. C. DE RENZI anticipates considerable use of the lamp for outside lighting by consumers who have none at present, and also thinks that it will enable the Electricity Department to secure the lighting of the streets in the centre of the town, which are lighted by gas at present. This, however, he says, is only on the assumption that the lamps will burn the full 1,000 hours.

**TWICKENHAM AND TEDDINGTON.**—MR. M. FARRER is now quoting for lighting a factory with half-watt lamps, and hopes to "pull it off," although he is in competition with high-pressure gas at very low rates. A 500-watt lamp should suffice to put in the shade the average high-pressure gas lamp as used for shop lighting. He regrets that nothing smaller than 2,000 c.p. is available for 240 volts, and is rather alarmed at the cost of renewals. He devoutly hopes that difficulties of manufacture will for a long time prevent the marketing of the half-watt lamp for ordinary domestic use, and incidentally fears that the introduction of the new lamp will be the "final blow" to arc lighting except in very special circumstances.

**WINCHESTER.**—MR. R. AXTON says that the only favourable view he can take of the matter at present is that the introduction of the lamp in workable candle-powers should enable every undertaking to gain control of the street lighting.

**NORTHWICH.**—MR. W. BOYD does not anticipate that the lamp will have anything but a beneficial effect upon output. Although the tungsten lamp was pushed vigorously from the start in Northwich, the output for lighting never fell below previous years. The ratio of increase was lowered for a few years, but business has gone ahead more quickly since.

**OBAN.**—MR. D. McLENNAN says the lamp has not been put on the market a day too soon. He extends to it a very hearty welcome in sizes large or small. He trusts it will be freely used "to curtail further destruction by poisonous and dangerously inflammable illuminants."

**WINDSOR.**—MR. A. E. FARROW says that the contemptuous attitude of the gas papers towards the lamp is evidence that they are realising its possibilities as a competitor. When the lamp is available in candle powers suitable for private houses, the depressing effect on the lighting load will be neither serious nor permanent. The standard of lighting has risen at every increase in efficiency until those who were satisfied with eight c.p. will now have no less than 25. There is also the present tendency to "comfort" lighting, which necessitates a somewhat higher consumption than the "more crude direct method." He concludes: "Mr. F. W. Goodenough gave his views of the relative costs of gas and electricity in the *Daily Mail* of March 3rd, 1909, putting the ratio at three. In view of what electricity has accomplished on a three to one handicap (assuming that Mr. Goodenough's figures are correct) to what may we look forward when that handicap is cut down by half?"

**KINGSTON.**—MR. J. E. ENDCOME writes: It is a good thing for the electrical industry generally, but the central station engineer, four-fifths of whose load is lighting, can but hope it may be some years before half-watt lamps in low candle powers are placed on the market. Stations in purely residential districts are now only recovering from the effects of metal filament lamps, but I can quite understand that engineers in manufacturing districts, where the lighting load is only a fraction of their total load, and who possibly have a large street lighting load, will welcome the half-watt lamp for street lighting purposes specially. On the other hand, the extra cost of the lamps over the present metal filament lamps will to a certain extent neutralise any saving in current consumption, and the accidental breakage of a few lamps, which may easily occur where a stock is kept, will be a serious expense.

**QUEENSTOWN.**—MR. F. L. WATSON is of opinion that in small towns of say 20,000 inhabitants and less, they will prove a godsend for street lighting. In connection with the high candle powers, he does not anticipate a very large field for interiors and exteriors of shops in small towns. When the lamps are made in sufficiently small units for private lighting, cooking and heating must be pushed, and special contract rates introduced. It is "up to" the makers of cooking and heating apparatus, he says, to produce an article that will be cheap, efficient, and strong. This, in conjunction with the half-watt lamp and suitable contract rates, would commence a new era in electrical supply.

**FALKIRK.**—MR. H. RANSON writes: I believe the half-watt lamp will prove the last nail in the coffin of gas lighting. Any tendency to disapprove of the new lamp owing to its possible effect on the lighting revenue is a most short-sighted policy. Had the 1½ watt lamp not been introduced, the use of gas would have been enormously extended. Provided the life of the new lamp is satisfactory, it should become a standard for street lighting in small towns. It is true that for efficiency it cannot even yet compare with flame arcs from the c.p. per watt point of view, based on photometer tests, but constancy of illumination is more important than extreme efficiency. Besides, I have yet to be convinced that the man in the street can tell any difference between, say, a 2,000 and a 3,000 c.p. unit unless he sees them burning side by side.

**ROCHDALE.**—MR. C. C. ATCHISON says the c.p. will be too large for anything but street lighting or for interiors of very large premises, and in Rochdale they have no street lighting by electricity, and no very large experience of large premises. He is inclined to think that consumers would prefer to use a number of small c.p. lamps for interior purposes, fearing the cost of renewals. On the other hand, outside lighting for shops can be better tackled by the use of a few large c.p. lamps.

**SHIPLEY.**—MR. W. REDMAN says the advent of the half-watt lamp will considerably hasten the universal adoption of electricity as an illuminant.

**ALDEBURGH, BUDE AND STRATTON, FRINTON-ON-SEA, MILFORD-ON-SEA, and TADCASTER.**—MR. F. CHRISTY, of Christy Bros. & Co., Ltd., who are responsible for the electric lighting of these places, does not think that the half-watt lamp will have anything like so marked an effect on small undertakings as the metal filament lamp, until the manufacturers are able to make them in much smaller sizes. In larger undertakings, however, the saving of labour will enable street lighting, and the lighting of factories and shipyards, to be carried out at much cheaper prices than with arc lighting, and will compare very favourably with the cost of high-pressure gas. Continuous current stations, he thinks, will, of course, feel the effect much less than the A.C. stations, as with the latter the low voltage transformers will again come into more frequent use. He is confident that in the long run any cheapening in production will benefit the industry, and adds that "if someone will invent a 'one-tenth' watt lamp in small sizes, we should have to go to Parliament for a special Act to enable us to charge by a rateable value on the lines of a water supply, or by some similar method."

**Faraday House Engineering College Scholarships.**—An examination will be held at Faraday House Engineering College, beginning on Wednesday, April 1st, 1914, for one "Faraday" Scholarship of the value of 50 guineas per annum, tenable for three years, and for one "Maxwell" Scholarship of the value of 50 guineas per annum, tenable for two years. Full particulars can be obtained from the Secretary, Faraday House, Southampton Row, W.C.

**London University Education.**—The University of London Graduates Association, of which Mr. A. S. E. Ackermann, of 25 Victoria Street, S.W., is Honorary General Secretary, has just published as a small pamphlet its objections to the scheme proposed by the Royal Commission on University Education in London. The reasons given are plain, straightforward, and cogent. They are largely directed against that part of the report which aims at abolishing the external work of the University. There are large numbers of engineers who would be sorry to see this carried out.

**Compulsory Working of Patents.**—Section 27 of the Patents and Designs Act, 1907, provides that after four years from the grant of a patent "any person may apply to the Comptroller for the revocation of the patent on the ground that the patented article or process is manufactured or carried on exclusively or mainly outside the United Kingdom." This Section was generally welcomed in industrial circles in this country, and one of its effects was the erection of several new works in this country. There have been comparatively few cases of patents being revoked under this Section, partly because adequate manufacture in this country by the owners of patents themselves, or the granting of licences, has rendered applications for revocation unnecessary, and partly because of the technical legal difficulty of adducing evidence to prove that the manufacture has been inadequate. In view of some decisions under the Act, there has been some agitation for its amendment, and the Manchester Chamber of Commerce is endeavouring to get the clause amended so as to place the burden of proof of adequate manufacture upon the patentee. This course is strongly opposed by the Chartered Institute of Patent Agents, who suggest that if this alteration were made, applications under the clause would be made by rival firms solely for the purpose of obtaining useful business information from the owners of the patents. They propose that the applicant for revocation should have to prove that he had been refused a licence under the patent on reasonable terms, and should undertake to manufacture the patented article himself if the patent were revoked.

## OVERHEAD LINE CONSTRUCTION FOR MEDIUM AND LOW PRESSURES

MR. A. P. TROTTER read an important Paper on overhead line construction for medium and low pressures before the Institution of Post Office Electrical Engineers on Tuesday last. The Paper states the present position very concisely and explains the Board of Trade rules and the modifications in the standard practice which have been allowed. On account of the importance of the subject, we are publishing the Paper almost in full, with the explanatory drawings and diagrams.

The routes of the lines considered are generally along streets or suburban roads. The first case which was officially authorised was at Keighley, in 1904. Two-wire distribution is generally confined to small towns or villages, and in a few cases power is supplied from tramway trolley wires. The suggestion has been made that the wires should be crossed at each span, the earthed negative being below the positive, to give some chance of a shut-down in case of breakage of the positive wire. In view of the very few cases of injury resulting from the breakage of trolley wires at 500 volts, the risk of accident due to the breakage of a wire at a

such a manner that in the event of breakage of an unearthed conductor it must fall on the earthed conductor or on wires connected thereto.

Hitherto no regulation had been made which was specially applicable to three-phase four-wire work. The earliest example of D.C. three-wire supply on this method was carried out by Mr. Reginald Wilson at Dudley at the end of 1906. Fig. 1 shows the arrangement. The structure required for carrying guard wires is seen at A, B, C. In the following year the same method was used by Mr. C. J. Wood, at Sale, Cheshire, Fig. 2. A single cross arm is used and the insulators for the neutral wires are of a very simple pattern appropriate for the small voltage from earth. About the year 1910 it was suggested by Mr. Harold Gray, of Accrington, that the neutral wires should be placed at a level higher than the positive and negative wires, and that they might be used as guard wires. This has the advantage that the cross wires form a deep pocket which is much more likely to catch a live wire than the arrangements shown in Figs. 1 and 2. The Board of Trade regulations relating to the supply by overhead lines was amended in 1911 to read thus:—

Where a supply is given by overhead wires on the three-wire system, the positive and negative conductors shall be placed

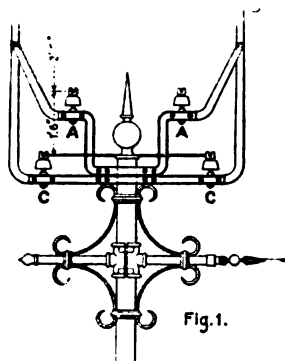


FIG. 1.—MR. REGINALD WILSON'S DESIGN AT DUDLEY, 1906. THE PARTS A B C MAY BE REMOVED.

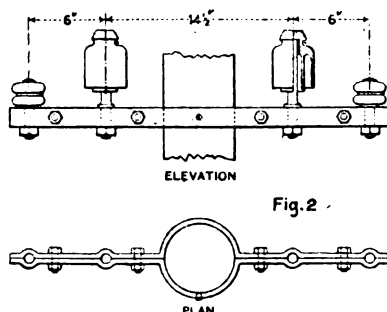


FIG. 2.—MR. C. J. WOOD'S DESIGN AT SALE, 1907.

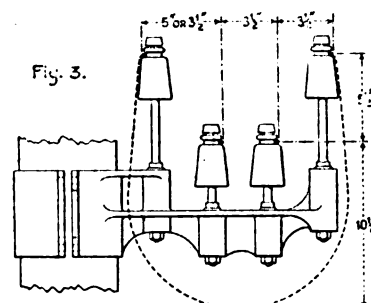


FIG. 3.—MR. HAROLD GRAY'S DESIGN AT ACCRINGTON FOR STREET LIGHTING.

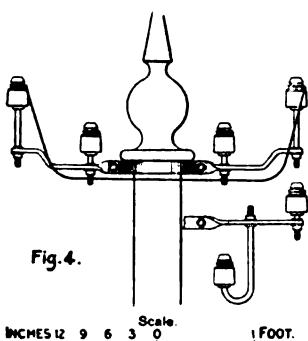


FIG. 4.—MR. C. L. E. STEWART'S DESIGN AT RAWTENSTALL, 1913, FOR TRAMWAY POLES.

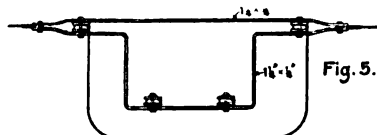


FIG. 5.—MR. C. L. E. STEWART'S DESIGN AT RAWTENSTALL, 1913, FOR SPAN WIRES.

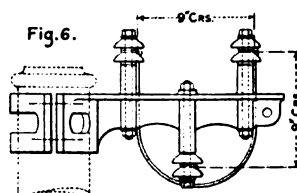


FIG. 6.—MR. H. B. HARVEY'S "TWO-WIRE" DESIGN.

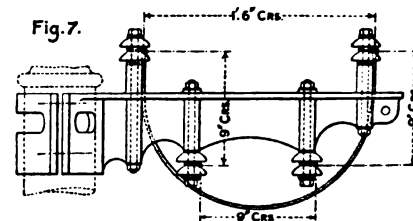


FIG. 7.—MR. H. B. HARVEY'S "THREE-WIRE" DESIGN.

pressure not exceeding 250 volts above earth is not serious, and may be entirely prevented by splitting the neutral into two wires and connecting these in each span by cross wires. This method was described in the early Board of Trade regulations. The regulations in force for medium and low pressures apply to D.C. supply at a pressure not exceeding 650 volts from earth, which is intended to include the maximum drop on an overhead tramway feeder, and for A.C. supply at a pressure not exceeding 250 volts from earth. The risk of a fatal shock at 250 volts A.C., unless a large surface of metal is touched, is not serious, but four fatal and one nearly fatal accident have resulted from this cause. In three of the fatal cases the middle point of the system was earthed. It is therefore necessary that precautions shall be taken to render a broken conductor harmless. Minimum-current circuit-breakers cannot be relied upon, balanced protective devices would be too expensive, and the only method seems to be the one suggested in a regulation which appears as No. 6 of the latest code of medium and low pressure overhead wire regulations of the Board of Trade. This regulation, which covers three-phase four-wire work, reads:—

Where one conductor of an overhead line is connected with earth, the other conductor or conductors shall be arranged in

side by side. The intermediate conductor shall consist of two wires placed side by side at a distance apart greater than that between the positive and negative conductors, and connected in each span by two cross wires placed in such a manner that in the event of either the positive or negative conductor breaking it shall fall on one at least of the cross wires.

The regulations have never called for more than two cross wires. These should be placed as far from the poles as can be conveniently reached from a ladder placed against the pole, say 5 ft. If placed too near to the pole, a wire might lie on the ground without touching the cross wire. If placed too far, the wires swaying in the wind are liable to touch the cross wires. For tramway spans of 120 ft. it is found that 6 or 8 in. is a suitable distance horizontally between two live wires, but Mr. Gray finds that in the case of a live wire and a switch wire, as shown in Fig. 3, a distance of 3½ in. may be used. The method of controlling the street lighting at Accrington from a central point is of interest. The lines diverge from a central point, and these are switched on for the first half mile. The last lamp operates a switch which puts on the next half mile, which is supplied from an underground distributor. The last lamp of this half mile switches on the next half mile, and so on. At Rawtenstall, Mr.



C. L. E. Stewart has applied this system to street-lighting circuits by direct current at 230 volts to earth on tramway routes. In his first design the outer neutral insulators were mounted on long spindles, and the cranking of the arm to avoid this (Fig. 4) was suggested by Mr. A. J. Stubbs, of the Post Office. But at Rawtenstall the tramway poles are sometimes set back in cross streets to avoid obstruction of the pavements of the tramway thoroughfare. Here it is necessary to carry the lighting wires on the span wires. Fig. 5 shows the arrangement he has devised. The span wire is cut, and a double bar,  $1\frac{1}{2}$  in. by  $\frac{1}{2}$  in. is inserted, carrying the neutral insulators. In Fig. 6 is shown a design made by Mr. H. B. Harvey for a two-wire circuit. This, however, has not yet been carried out. One of the upper wires is an earthed neutral, and the other is an earth wire for earthing the brackets and tramway poles. The shackle insulator is of stock pattern, and is mounted on a bolt. In Fig. 7 is a design in which the two upper wires are neutrals, and the lower ones live wires.

(To be concluded.)

## ELECTRIC TRACTION NOTES

At Tuesday's meeting of the L.C.C. the report of the House of Commons Committee on London Traffic was discussed in connection with a long statement by the General Purposes Committee. This Committee recommended that the Council should concur with the views of the Select Committee that in all Metropolitan traffic matters Parliament should be advised by one department, which should combine the traffic duties of the Home Office, Local Government Board and Board of Trade. Further, that the Council should agree to accept a new Traffic Branch of the Board of Trade as a suitable authority for dealing with traffic matters in Greater London, provided that it consists of a small number of specially qualified persons selected solely on the grounds of their competence, such persons to hold office for a considerable period. The recommendation was eventually passed, practically unanimously.

Following the recent decision of the Board of Trade cancelling the licence to use the Dolter surface-contact system on the sea-front at Hastings, experiments have been made with a petrol motor-driven tramcar.

A Sub-committee of the Nelson Town Council has been inspecting a number of trolley-omnibus installations with a view to adopting this form of traction in Nelson.

In the jubilee number of *The Railway News*, just produced, is an article on the use of electricity for train lighting. This is devoted to a description of the Tudor Accumulator Co.'s (T. A. C.) system, and to a description of Messrs. Pritchett & Gold's accumulators, as being representative of current practice. In the T. A. C. system a compound-wound, belt-driven dynamo is suspended under a coach, preferably on the bogie frame, and is provided with an automatic switch to control the charge or discharge of the accompanying storage battery as the speed of the train varies. There are two coils to the switch; one is connected across the dynamo brushes and the other is in series with the dynamo. As soon as the dynamo pressure is sufficient, the shunt coil closes the switch and connects the dynamo to the battery. The series coil assists the shunt coil as long as the dynamo is generating, but as soon as the pressure across the battery terminals exceeds that generated by the dynamo sufficient to pass two or three amperes through the series coil, the switch is opened and the lighting done by the battery—across which the lamps are permanently connected—in series with iron wire resistances, so long as they are alight. The battery itself is usually of fifteen lead cells with Planté type positives. To control the output of the dynamo a switch actuated by a coil connected across the dynamo terminals is set to open the dynamo circuit as soon as the battery is fully charged, and not to close again until the dynamo is nearly at rest. When this switch is closed its armature short-circuits three or four contacts, depending on the number of circuits to be controlled, and when open, as well as disconnecting these, it increases the resistance in the dynamo field circuit, so as to reduce the output to suit the load. These switches are usually mounted in a box in the coach. Another interesting article deals with the development and perfection of railway signalling, including block working, and the necessary instruments. Power and automatic signalling is also covered. There are also articles on the position of main line and suburban railway electrification in the United Kingdom and abroad, and descriptions of

the London Underground railways, but the bulk of the voluminous issue is devoted to the engineering and administrative sides of railway engineering all over the world. There are a number of illustrations of present-day practice, as well as many of historical interest.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

It is now practically certain that wireless installations will be made compulsory on ships carrying fifty persons. This is the result of the deliberations of the International Conference on the Safety of Life at Sea, which has now completed its work, and has drawn up a "Convention," signed by representatives of Germany, the United States, Australia, Austria-Hungary, Belgium, Canada, Denmark, Spain, France, Great Britain, Italy, Japan, Norway, the Netherlands, Russia, Sweden, and New Zealand. The convention has to be ratified by December 31st by the various States, and will then come into force on July 1st, 1915. Under the International Radio-Telegraphic Convention, ships were classified in three categories:—(1) Fast passenger steamers; (2) Steamships intended to carry twenty-five passengers or more; (3) Other vessels. It is now proposed that all merchant vessels, whether steamers or sailing vessels, engaged on international voyages, and whether carrying passengers or not, must be equipped with wireless telegraph apparatus if they have on board fifty persons or more, whether crew or passengers, but there is discretionary power to exempt vessels not travelling more than 150 miles from shore. It is laid down that continuous watch for wireless telegraph purposes should be kept by all vessels required to be fitted with wireless apparatus, by vessels as follows:—(1) Vessels of more than 13 knots which carry 200 or more persons, and which make voyages of more than 500 miles between two consecutive ports; (2) Vessels in the second category mentioned above, during the time they are more than 500 miles from land; (3) Other vessels required to be fitted with wireless apparatus which are engaged in Transatlantic trade, or whose voyage takes them more than 1,000 miles from land. Vessels in the second category which do not come within the above definition must keep watch for at least seven hours a day, besides the watch of ten minutes in each other hour required by the Radio-Telegraphic Convention. Fishing and whaling vessels are not required to keep a continuous watch. The watch is to be kept by qualified operators, and provision is made for the possible future introduction of an automatic apparatus to take the place of watchers. The wireless installation must have a range of at least 100 miles, and an emergency apparatus placed in the conditions of the greatest safety possible must be provided unless the main installation is placed in the highest part of the ship and in the conditions of the greatest safety possible. A transitional period is provided to enable wireless apparatus to be fitted, and operators and watchers to be obtained.

We have announced from time to time the decision of the Post Office to instal automatic telephone exchanges in different towns. We learn from *The Post Office Electrical Engineers' Journal* that, in addition to exchanges already working at Epsom and Hereford, the following are in course of erection:—Newport (Mon.), 1,800 lines; Portsmouth, 5,000 lines; Accrington, 700 lines; Paisley, 1,100 lines; Chepstow, 65 lines; Leeds, 6,800 lines. The equipment of these is being supplied by the Automatic Telephone Manufacturing Co., while the Western Electric Co. is equipping exchanges at Darlington, 800 lines, and Dudley, 500 lines. Siemens Bros. & Co. have in hand an order for an automatic exchange at Grimsby, 1,300 lines, and Stockport, 950 lines. The official switch is also to be extended by 150 lines.

Telegrams for Syria are no longer subject to delay.—Telegrams for all offices of the Republic of San Salvador excepting La Libertad are only accepted at senders' risk.—The Indo-European lines are down between Odessa and Kertch.—Deferred telegrams can be sent to Cyprus via Alexandria-Eastern.

**L.C.C. Scholarships.**—The London County Council is prepared to award 15 scholarships for full-time day instruction, and 180 exhibitions for evening instruction, in science and technology during 1914. Application for information and forms should be made to R. Blair, Education Officer, L.C.C. Education Offices, Victoria Embankment, W.C. The forms must be returned not later than February 14th.

# "ELECTRICAL ENGINEERING" PATENT RECORD

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## Specifications Published January 15th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

21,745/12. **Wireless "Calling-up."** W. H. SHEPARD and A. E. McKECHNIE. A signal representing the name of the receiving station is automatically transmitted as soon as the receiving apparatus is rendered operative by the transmitting apparatus at the calling station. The alarm, which comes into operation at the time that the receiving apparatus does, is an automatic transmitter, which then keeps sending the pre-arranged signal until the alarm is put out of action by the removal of the telephone receiver. The alarm is described in patent specification No. 11,479/12. Eight figures.

26,800/12. **Ductile Tungsten for Drawing Filaments.** C. TRENZEN. To make tungsten or other non-ductile or slightly ductile metals ductile by mechanical working, hydraulic pressure is applied to the amorphous metal, which must contain no crystalline particles or oxide, when for the first time heated to a temperature at which it tends to become crystalline. Thus, increase of density is brought about at the moment when, as the result of heating, the change from the amorphous to the crystalline would tend to occur.

29,384/12. **Mercury Vapour Telephone Relay.** H. DE FOREST ARNOLD (Western Elec. Co.). This invention comprises an arrangement of apparatus, part of which consists of an ionised stream, such as a mercury vapour arc, which is deflected under the influence of a magnetic field. There is a circuit in which the current variations in the incoming circuit are reproduced in circuits independent of the ionised stream. A non-arc gap in the outgoing circuit is arranged transversely across the ionised stream and to the magnetic field, produced by an electromagnet placed as near as possible to the longitudinal centre of the ionised stream. The outgoing circuit is comprised of a balanced differential circuit connected to electrodes of special design and arrangement. Two figures.

29,461/12. **Liquid Controller.** R. F. BAERLOCHER and ALLEN WEST & Co. The liquid is maintained at a constant level while the electrodes themselves are moved. They are balanced by a weight moving in a separate container, to which water is added at any desired rate. This reduces the effective weight of the balance weight, and so allows the electrodes to fall by gravity to the full-on position. It is smaller than most liquid controllers, and requires no pump if a water supply is available, otherwise a small pump is necessary. Two figures.

9/13. **Cleaning Metallic Surfaces.** C. H. THOMPSON. The articles to be cleaned are immersed in an electrolyte through which an alternating current is passed between separate electrodes which are protected by perforated or porous partitions. The electrolyte must set free hydrogen kations and anions of HCl or HNO<sub>3</sub> or H<sub>2</sub>SO<sub>4</sub> or HP or HBr or HCN or CrO<sub>3</sub>.

2,749/13. **Semaphore Railway Signals.** R. M. DE VIGNIER (Western Elec. Co.). The semaphores are electromagnetically moved to danger under the control of a distant operator and manually moved to the safety position. A clock-train interrupting mechanism is mechanically associated with each semaphore so that it is released only after a predetermined movement of the semaphore and signals to the operator that the movement has been effected. Five figures.

9,530/13 and 10,018/13. **Lamp Substitutional Resistances.** W. HEINS. A small disc of carborundum with convex sides is placed in parallel with the lamp or lamps, and is found in case of failure of the lamps to assume the same resistance as the lamp, whereas as soon as the lamp circuit is completed through a new lamp the carborundum reverts to its normal high resistance. A substitute lamp may be brought into circuit by the heating of the carborundum acting on a contact in its circuit. There are three and two figures to these specifications.

9,685/13. **Amortisseur Windings.** B.T.-H. Co. and F. P. WHITAKER. To prevent locking of armature and field, the amortisseur bars in one pole pitch occupy a different relative position to the centre line of the armature slot from those in the other pole pitches. One figure.

## Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.** B.I. & H. Co. and BLADES [Cable connecting boxes] 29,774/12; INGHAM [Bituminous compositions] 1,458/13; MANSON [Fibre board] 2,287/13; B.T.-H. Co. (*G.E. Co., U.S.A.*) [H.P. insulators] 8,675/13; "VULKAN" MASCHINENFABRIKS A.G. [Motor control for reciprocating machines] 12,131/13.

**Dynamos, Motors and Transformers:** MELLERSH-JACKSON (*Caldwell*) [Vacuum valve tube rectifiers] 29,839/12; ROSENBERG [Synchronous machines] 6,891/13; MASON [Ignition dynamos] 8,964/13; LUDWIG [Commutator truing] 20,912/13.

**Electrometallurgy and Electrochemistry:** TISCHENKO and PLAUSON [Iron and steel manufacture] 27,147/12; GRÜCHTEL [Welding] 331/13; JOHNSON (*Badische Anilin & Soda Fabrik*) [Gas reactions in arc furnaces] 974/13.

**Ignition:** MORDEY, 24,563/12; RUNBAKEN [Spark plugs] 333/13; DIRAND [Spark plugs] 11,737/13.

**Incandescent Lamps:** GARDE [Candle lamps] 24,971/12; KAST [Preparation of metals and metal oxides in a minutely divided state] 5,212/13; ZSCHOCKE, 7,059/13.

**Meters:** B.T.-H. Co. and YOUNG [Mercury motor] 1,855/13.

**Switchgear, Fuses and Fittings:** MARTYN [Incandescent lamp holders] 80/13; TURNER [Switch casings] 212/13; HARRISON and FRASER [Lamp reflectors] 8,881/13; MOORE [Annunciator and circuit changer] 10,157/13; ZUMPE [Casings for pocket battery lamps] 14,091/13.

**Telephony and Telegraphy:** SHEPARD and McKECHNIE [Alarms for wireless] 22,036/12; PARRY [Recording telephone messages] 29,874/12; HEURTLEY [Telegraphy] 316/13; CREED, BILLE & Co. (*Bille*) [Automatic telegraph transmitters] 3,883/13; BECKMANN and A.G. MIX & GENEST [Selector for party-line telephones] 11,579/13; SIEMENS & HALSKE [Prepayment mechanism for telephones] 16,376/13.

**Traction:** DRAKE and BURNETT [Trolley collectors] 7,213/13; GALLUSSER [Electric controlling valve for air-brakes] 8,865/13; CROSS [Electric road vehicles] 18,819/13.

**Miscellaneous:** ELEC. HAMMERS and SCOTT [Portable hammers for caulking, &c.] 24,941/12; HELM [Coils and their manufacture] 91/13 and 4,091/13; SCHNYDER [Electromagnetic type-writers] 2,170/13; HASLER A.-G. VORM TELEGRAPHENWERKSTATTEN VON G. HASLER [Speed indicator] 12,474/13; SIEMENS BROS. (*Siemens & Halske*) [Optical pyrometers] 17,927/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** KORTING & MATHIESEN A.-G., 27,878/13; STAVE [Globes] 29,425/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.** MEHLUM [Machines for making fibre tubes] 28,423/13; MACNAB [Distributing and control systems] 29,216/13.

**Dynamos:** BETHENOD [Maintenance of constant pressure] 27,852/13; DE LA RIBOISIÈRE [Magnet] 29,562/13.

**Ignition:** VOIGT & HAEFFNER A.-G. [Polyphase current starters] 19,648/13.

**Switchgear, Fuses and Fittings:** A.-G. BROWN, BOVERI [Reversing and braking A.C. motors] 28,933/13.

**Telephony and Telegraphy:** DR. ERICH F. HUTH GES. [Wien's shock excitation system for wireless] 28,369/13; BETULANDER [Automatic and semi-automatic telephone exchanges] 29,615/13.

**Miscellaneous:** RIBOISIÈRE [Operating automobile door sashes, &c.] 26,060/13; PILLERSDORF [Alarm clock] 27,541/13; SCHERBIUS [Introduction of wires or conduits into evacuated vessels or casings] 29,609/13.

The following Amended Specification may now be obtained:—  
**Miscellaneous:** W. J. BEVILLE [Sign] 19,736/11.

## Grant of Patent Allowed

9,112/11. **Constant Pressure Variable Speed Dynamo.** A. H. MIDGLEY and C. A. VANDERVEIL. The Comptroller's decision to grant this patent in spite of opposition has been upheld by the Law Officer on appeal.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

1,617 of January 25th, 1900. **Carbon Switch Contact.** A. REICHWALD (*Friedr. Krupp A.-G., Germany*). The carbon block is in the form of a truncated cone with flat base, and is held to its carriage by a screwed collar bored conically to grip the sides of the carbon.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos and Motors:** R. LUNDELL [Starting single-phase induction motors by extra currents fed into rotor] 19,899/05.

**Incandescent Lamps:** B. T.-H. Co. (*G.E. Co., U.S.A.*) [Squirted metallic filaments] 21,504/06; [Connecting metallic filaments to leading-in wires] 21,506/06.

**Traction:** J. G.-V. LANG and JOHNSON-LUNDELL ELEC. TRACTION Co. [Regenerative control using series motors] 20,721/08.

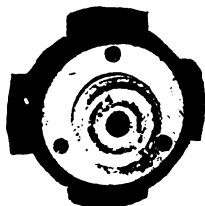
**Miscellaneous:** J. W. MILLIGAN and H. RALLINGS [Grinding and polishing pen-nibs] 19,363/01.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 54. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**SMALL MOTORS.**—A new abridged list of A.C. and D.C. motors of powers from 1/50 h.p. to 25 h.p. has just been issued by The Sun Electrical Co., Ltd. (118-120 Charing Cross Road, W.C.). Included is a range of motor-driven drills, grinders, and polishing machines, as well as a range of small motors with clamps for the individual driving of sewing machines. Particulars of suitable starters for all the motors are also given.



**UNIVERSAL CONDUIT BOX.**—Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), have published a supplementary sheet which gives particulars of their Universal conduit boxes. These are listed at considerably lower prices, due to improved methods of manufacture and increased output. The box is primarily intended for screwed conduit installations, and can be used as a bend or T-box for mounting such accessories as ceiling roses, switches, wall plugs, and so forth. Full particulars and prices are given for the box used with all these combinations, in addition to prices for the box alone, not drilled or tapped for conduit.

**TIME SWITCHES.**—A leaflet from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), describes a neat time switch. The clock has a lever movement, and is easily accessible, and the apparatus automatically adjusts the time of lighting and extinguishing the lamps according to the season of the year.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**"STRIPLITE."**—Another leaflet from the General Electric Co., Ltd., deals with the construction and prices of the "Striplite" system of concealed lighting. The lamps and fittings are available in different sizes, and with aluminium or china reflectors for shop windows, show cases, &c.

**GLOWING RADIATORS, &c.**—The Electrical Supplies Co. (41 Cheapside, E.C.) has in preparation a comprehensive list of luminous lamp radiators, convectors, radiant electric fires, cooking utensils, &c., in a large number of designs. While this is being compiled, however, an advance list is being circulated. Representative designs of many types of radiator for office or drawing-room use are listed in it.

**LIGHTING AND PUMPING SETS.**—A leaflet from De Russett Bros. (4 Page Street, Westminster), relates to petrol-electric and paraffin-electric, direct-coupled electric lighting sets, and also pumping sets.

**ALUMINIUM CHEMICAL PLANT.**—A pamphlet from the British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), deals with the use of aluminium in the varnish industry, as well as for sugar refining, brewing, dyeing, &c.

**BLUE PRINTING.**—The Westinghouse Cooper Hewitt Co., Ltd. (80 York Road, King's Cross, N.), has issued a new list dealing with the use of mercury vapour lamps for blue printing. The lamps are now supplied for taking continuous prints of all kinds, either 0.32 in., 45 in., or 60 in. wide. In a recent test satisfactory results were obtained at the rate of 23 ft. per min.

**PRESSURE GAUGES.**—Three new catalogues, superseding previous issues, have been sent out by Schäffer & Budenberg, Ltd. (Whitworth Street, London Road, Manchester). The catalogues respectively deal with self-recording pressure gauges; gun-metal taps, iron syphons, &c.; and reciprocating and rotary counters.

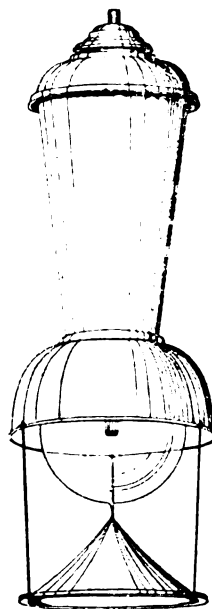
A pretty calendar has been sent us by Mawdsley's, Ltd. (Dursley, Gloucestershire), who are the manufacturers of the well-known "Zone" dynamos and motors. The calendar, which is in a restful brown, bears a reproduction of the picture by W. H. Margetson, entitled, "When Autumn Breezes Blow."

A bold wall calendar in green and white is that sent by the Liverpool Electric Cable Co., Ltd.

We are pleased also to receive a wall calendar from W. A. Walberg & Co. (38 Victoria Street, Westminster, S.W.), who are suppliers of machine tools and workshop equipments.

A calendar of rather striking design, in which the essential part is clearer than is often the case, is being sent by the Union Electric Co., Ltd., to its friends.

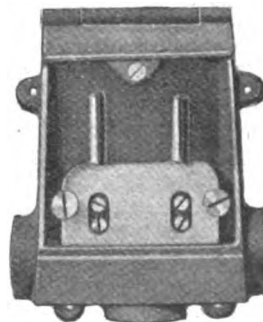
### FITTING FOR "HALF-WATT" LAMPS



London agents for the Wardle Engineering Co. are Messrs. Nathan & Allen (Queen Anne's Chambers, Westminster, S.W.).

THE fitting here illustrated has been designed primarily for street lighting or similar purposes with "half-watt" lamps. The height of the lamp in the fitting is adjustable, so that it can be focused. The fitting is well ventilated, and mechanically is designed upon the usual well-known principles of the Wardle Engineering Co., Ltd. (196 Deansgate, Manchester), who are manufacturing it and will have it on the market within the next fortnight. The fitting may be supplied with automatic cut-out and substitutional resistance for series working if necessary. The overall height is 3 ft., and the reflectors are designed to reach the maximum candle power at an angle of 20° from the horizontal. The filament itself is above the level of the bottom of the top reflector, and the horizontal rays are reflected from the interior of the reflector back again at the desired angle, the upper and the lower rays being reflected at a similar angle from the opal conical reflector underneath the lamp. The

### A STAGE LIGHTING PLUG



work call for a large number of points situated about the stage from which a supply of electricity can be drawn at a second's notice. Particularly is this so in the case of music halls, where the interval between "turns" is merely a few seconds. A plug and socket which has been designed by a stage engineer to meet the stringent conditions of such work has recently been introduced by the General Electric Co., Ltd., of 67 Queen Victoria Street, London, E.C. This is known as the "Morehen" plug, and is an adaptation of the G.E.C. dock plugs. The socket is fixed under the stage level, and affords every facility for taking temporary leads to portable stage properties. The plug portion is of hard wood, and is practically unbreakable and has no projecting pins, while the counter-sunk contacts preclude all danger of shock. When the plug is removed the protecting lid automatically closes up the plug entrance, so that there is little liability for water or dust to enter the interior. Nevertheless, under extreme circumstances it is impossible to keep water out, and in order that any water entering may immediately be discharged, the socket is designed with tapering sides and with an inclined bottom, in which are two holes. The illustrations show the plug and the interior of the socket. It is impossible to reverse the polarity, and the plug can therefore be used on arc lamp circuits. It can also be supplied for incandescent lamps. Plugs for these types of circuit are not interchangeable. We believe that these plugs have been supplied to a number of theatres and music halls, in which they have met with every success.

## ILLUMINATED HOARDINGS

To get the best results from posters, they should be artificially lighted at night, so that their message is always before the public, instead of being automatically interrupted at a time when people have the most leisure in which to study them. The British Thomson-Houston Co., Ltd. (77 Upper Thames Street, E.C.), has shown what can be done in this direction by means of modern electric lamps and properly designed reflectors. An effective example is



HOARDING ILLUMINATED BY MAZDA LAMPS AND MAZDALUX REFLECTORS.

afforded by the poster shown in the illustration. This is from an untouched night photograph. This poster measures 11 ft. by 8 ft., and was put up some weeks ago to advertise a series of performances of *The Mikado*, given at a Rugby theatre by the B.T.-H. Social Club. The installation consists of a row of Mazdalux weatherproof metallic angle reflectors and Mazda drawn-wire lamps, fixed above and in front of the hoarding in such a position that the light is thrown evenly over the whole area.

## OSRAM DRAWN WIRE BATTERY LAMPS

WE have just received from the General Electric Co., Ltd. (87 Queen Victoria Street, E.C.), their new list of Osram drawn-wire battery-type lamps. This list covers all types of lamps from the tiny bulb of less than  $\frac{1}{4}$  in. in diameter for medical and scientific work, up to the powerful 50-c.p. for use in automobile headlights. Many important alterations and improvements have been effected, whilst a number of entirely new types have been added. We note that wherever possible the size of bulbs has been reduced and new improved



FIG. 1.—MOTOR-CAR HEAD-LIGHT LAMP.



FIG. 2.—MOTOR-BUS LAMP.



FIG. 3.—TUBULAR MEDICAL LAMP.

filaments have in a number of cases superseded the earlier ones. A new type of Osram headlight lamp, in which special care has been paid to the correct form of filament for use in parabolic reflectors (see Fig. 1) has been introduced. The construction of the helical filament is clearly seen from Figs. 4 and 5. In this connection reference may be made to

another G.E.C. publication entitled "Motor-Car Lighting by Osram Drawn-Wire Lamps." This is a tastefully got-up booklet dealing fully with the theory and practical application of efficient motor-car lighting. The disposition of the lamp filaments and the behaviour of reflectors is fully dealt with. For side lamps a bow filament is used, and for dashboard and tail lamps horizontal spiral filaments. Equal care has been given to automobile lamps for interior lighting. For miners' and other portable lamps a bulb giving a minimum of 1 c.p., in accordance with the Home Office Regulations, has been designed. Types of lamp for sign illumination are listed, which, owing to their low current consumption, enable the



FIG. 4.—ENLARGED VIEW OF DRAWN WIRE FILAMENT USED IN HEAD LAMP.



FIG. 5.—ENLARGED VIEW OF ARRANGEMENT OF FILAMENT.

use of a larger number of lamps in each sign than has hitherto been the case with carbon filament lamps. This ensures a more equal distribution of light over the entire surface to be illuminated. An entirely new pattern of motor-bus lamp, which, we are informed, is being already largely taken up by London and provincial companies, is listed for 12 volts 10 c.p. This type is manufactured in tubular shape with a bow filament (see Fig. 2).

Lastly, we would draw attention to the special lamps for medical and scientific work, which, although so small (Fig. 3), have an efficiency of approximately one watt per c.p.

A miniature list of these lamps is also available.

## "WOTAN" BATTERY LAMPS

A NUMBER of improved "Wotan" drawn-wire battery lamps are included in the revised list just issued by Siemens Bros. Dynamo Works, Ltd. (Incandescent Lamp and Fittings Department, Tyssen Street, Dalston, N.E.).



AUTOMOBILE HEAD LAMP.

We illustrate the focussing type lamp with helical filament for automobile headlights, &c. A committee of the Society of Motor Manufacturers and Traders has been working on the important problem of the standardisation of lamps for automobile lighting, and the automobile lamps put on the market are designed in accordance with the anticipated recommendations of this committee. Flash-light, flame, festoon, and tubular lamps are also listed in variety, while there is a number of lamps suitable for sign lighting, illumination schemes, &c. A neat folder suitable for overprinting with name and address of retailer, is available, and can be supplied to any trade customer. Messrs. Siemens state that it is their intention to circularise the trade with these lists, and they anticipate that under the new conditions the turnover in these types of lamps will greatly increase.

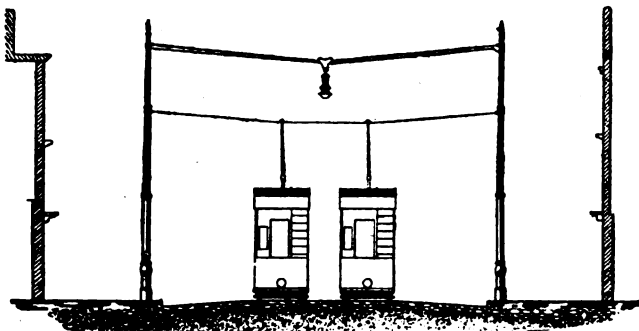
**Incandescent Lamp Cartons.**—We have received from the Britannia Folding Box Co., Ltd. (Dacre Road, Old Ford, E.), a sample of a patent folding carton for metal filament lamps. This is used by at least one well-known firm of lamp manufacturers. Holes are provided at the ends for the accommodation of the cap and pip, and a circular inspection hole is provided in one side.

**Electric Bull's-eye Lanterns for the Police.**—An order has been placed for 600 dry-battery tungsten lamp torches by the Port of London Authority for the use of the Dock Police. A contract for the supply of 600 dozen refills has also been entered into. The torches themselves do not differ greatly from those already on the market, but the joints and switch have been strengthened. It has been stated in the daily Press that the City of London Police are to be equipped with electric bull's-eye lanterns in place of the present oil bull's-eyes. We are in a position to state, however, that neither the City nor Metropolitan Police have yet so decided, although tests have been carried out with different makes of lanterns for the last two or three years. A lantern with an unspillable storage battery will, however, probably be adopted in the early future.



## CENTRAL SUSPENSION LIGHTING

IN connection with the Road Board's recent pronouncement in favour of central suspension lighting, and pending also the settlement of the compulsory powers which are being sought in various towns to attach brackets to buildings,



CENTRAL SUSPENSION LIGHTING, USING TROLLEY POLES.

it may be noted that existing tramway pillars may in many cases be utilised for carrying the span wire for the support of arc or metal filament lamps. The general arrangement of the system devised by The London Electric Firm (George Street, Croydon) is shown in the illustration.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Dorking.**—Messrs. Edmundson's propose to extend the supply to Westcott, at an estimated cost of from £2,000 to £2,500.

**Congleton.**—The Rural District Council requires additional cable for its sewage disposal works, at an estimated cost of £400.

**Dundalk.**—Electrically-driven pump, washing and wringing machine, at the workhouse. Clerk to Guardians.

**Inverurie.**—The Council is inquiring of the Great North of Scotland Railway Co. upon what terms it would give a supply of electrical energy in bulk from its power station in the district.

**Leeds.**—A twelve months' supply of cable, lamps, fittings, &c., is required by the Electricity Department. February 21st. (See advertisement on another page.)

**London: Hackney.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £200 for apparatus for automatically controlling the voltage of the alternators at the power station.

**Loughborough.**—The L.G.B. has sanctioned an expenditure of £11,000 upon new buildings and plant, and £3,000 on new mains and services.

**South Africa.**—The Paarl Council has approved plans of an electric lighting scheme at an estimated cost of £35,000. Particulars will shortly be available at 73 Basinghall Street.

**Wolverhampton.**—Extensions of mains to Goldthorn Hill are contemplated at an estimated cost of £129, and in Walsall Street at £210. In order to meet the increased supply in the Tettenhall Road district, the School Street sub-station and the Chapel Ash sub-station are to be connected up at an estimated cost of £110.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bolton.**—Cinematograph theatre in Blackburn Road.

**Hythe.**—New concert hall. Town Clerk.

**London.**—Block of flats in the Adelphi. Architect, E. Cannell, 28 Martin's Lane, E.C.

**Manchester.**—Extensions of exchange (£600,000).

Electric lighting of Chorlton-cum-Hardy Library. Town Clerk, January 26th.

**Nottingham.**—Conversion of Caledonian Hotel, Listergate, into General Stores.

New Drill Hall in Exchange Street, Retford. Territorial Association.

**Sunderland.**—New cinematograph theatre, Main Street.

## Miscellaneous

**Birmingham.**—The Birmingham, Tame and Rea District Drainage Board requires a twelve months' supply of electrical stores. February 11th. Engineer, Board Offices, Tyburn.

**Llandudno.**—Arrangements have been made between the Llandudno and Colwyn Bay Electric Railway and the Council concerning certain street widenings, and the extension of the line to Old Colwyn is to be commenced very shortly.

**Salford.**—Electric lifts at the Town Hall. J. B. Broadbent, 15 Cooper Street, Manchester.

**Tasmania.**—The Deputy Postmaster-General, Hobart, requires 200 common battery telephones. Further particulars at 72 Victoria Street, S.W., and 73 Basinghall Street, E.C. Tenders by March 2nd.

**West Ham.**—Various stores for Electricity Department. Town Clerk. February 6th. (See advertisement on another page.)

## TENDERS RECEIVED AND ACCEPTED

**Admiralty.**—The Edison & Swan United Electric Light Co. have received a twelve months' contract from the British Admiralty for the supply of ampere gauges, from 15 to 500 amperes.

**Bradford.**—A recommendation of the Electricity Committee that an order should be placed with a Berlin firm for the turbo-alternator advertised in our issue for November 27th, 1913, has caused much comment, and it is possible that serious protests will be made before the matter is finally settled by the Corporation.

The Council has accepted tenders amounting to £18,270 for the supply of railless cars and equipments.

**Dundee.**—In connection with the extensions which are under consideration a repeat order has been placed with Willans and Robinson for a 5,000-kw. (Willans-Dick, Kerr) turbo-alternator and condensing plant.

## APPOINTMENTS AND PERSONAL NOTES

Lieutenant-Colonel Fowler, Commandant of the Army Signalling School, has been added to the Committee on Research in Wireless Telegraphy, appointed by the Postmaster-General a few months ago.

Colonel C. H. Wright, who has been Chairman of the Electricity and Gas Committees at Stafford for fifteen years, has been presented with a pair of silver tureens by the staffs on the occasion of his resigning from that position.

The Doncaster Corporation requires two pupils for its electricity works. Premium £50, with small salary. Applications to Borough Electrical Engineer by January 30th.

A colliery electrician is required for a small A.C. and D.C. installation. (See advertisement on another page.)

A correspondence clerk is required. (See advertisement on another page.)

A boiler-house fitter is required in the Bristol Corporation Electricity Department. (See advertisement on another page.)

Plumber-jointers are required at Prescott. (See advertisement on another page.)

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Electric Construction Co.**—An interim dividend at the rate of 7 per cent. has been declared upon the preference shares for the half-year to November 30th.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.  
Telephone:  
3067 Victoria.

Telegrams & Cablegrams:  
"Infusion,"  
London.

CIRCUIT  
BREAKERS.

RECORD'S PATENT.

Write for Prices & Particulars.

WORKS:  
BROADHEATH,  
MANCHESTER.

Telephone:  
164 Altrincham.

Telegrams & Cablegrams:  
"Infusion,"  
Altrincham.

# OSRAM

## LAMPS

### Important Notice

## JUDGMENT

THE OSRAM LAMP WORKS, LTD., beg to inform the Trade and the Public that on October 31st, 1913, in the High Court of Justice, Chancery Division, Mr. Justice Astbury **GRANTED AN INJUNCTION** against **THE YORKSHIRE INCANDESCENT ELECTRIC LAMP CO., Ltd., Concord Street, Leeds,** (by consent of Defendants), in the action against them instituted by the OSRAM LAMP WORKS, Ltd., for infringement of OSRAM Patents 23899\* of 1904 and 18622 of 1906, the validity of which had been previously certified by the Court. The lamps complained of in such action were marked

### "Y.R." LAMPS

IT WAS FURTHER ORDERED that the Defendants deliver up to the Osram Lamp Works, Ltd., or destroy in the presence of their representatives, all such infringing lamps in their possession, and that an inquiry be held to ascertain what damages have been sustained by such infringement, and that the Defendants pay the Osram Lamp Works, Ltd., their full costs, charges, and expenses in the action as between solicitor and client.

**WARNING! Dealers in and users of similar infringing lamps will be proceeded against.**

## LOCAL NOTES

**Blackpool: Electricity Tariff.**—The rateable value tariff has been suggested by Mr. C. Furness, the Borough Electrical Engineer, who reports also that since the introduction of the  $\frac{1}{4}$ d. tariff for cooking and heating in 1908, 400 radiators have been connected to the mains. Regret is expressed, however, that more progress has not been made with the electric cooking outfits, and in this direction a special effort is to be made by the Department.

**Carlisle: Electricity v. Gas.**—At the last meeting of the Corporation a long discussion took place upon a motion by the Gas Committee recommending that the Council should order that when the Electricity or Gas Departments are requested to quote rates for lighting or power to the same consumer, the Committees should confer before any quotation is made, with a view to preventing unnecessary competition and cutting of prices. This was strongly resented by the Electricity Committee, the Chairman of which argued that the electricity undertaking should be allowed to develop unfettered by any such restriction. Eventually, however, the Council passed the Gas Committee's recommendation by twenty votes to sixteen.

**Cromer: Transfer of Electricity Undertaking.**—The Council has agreed with Messrs. Edmundsons Electricity Corporation that the electricity works shall be transferred to the Company as from March 25th next.

**Edinburgh: Electricity Reserve Fund.**—At the last meeting of the Corporation, Bailie Stevenson, Convener of the Electricity Committee, moved that the Corporation should increase the maximum of the reserve fund of the electricity undertaking from the statutory 10 per cent. of the capital expenditure to 15 per cent., provided that the payments into the fund in excess of the present maximum shall not exceed  $1\frac{1}{2}$  per cent. per annum of the total capital expenditure. There was very considerable opposition to the proposal, as also was there to a suggestion that the matter should go to the Treasurer's Committee for consideration. Eventually the debate was adjourned to allow the Town Clerk and City Chamberlain to prepare a detailed report on the matter. The point of objection to the scheme was that by increasing the reserve fund in this way, either the consumers will be debarred from legitimate reductions in price, or the ratepayers will be prevented from receiving benefits from the electricity undertaking which they otherwise would do. On the other hand, the object of the recommendation, it was pointed out, was that £100,000 will have to be spent in the near future upon a new power station which for a little while would be unremunerative, and the only way of recovering this deficit was either by increasing the charges to consumers, or calling upon the reserve fund. This at present is up to the full limit of the 10 per cent., but the Committee do not think it wise that it should go below this, and consequently recommended that it should be increased, and thus obtain a sum in hand over the 10 per cent. by the time the extra capital expenditure was to be made.

**Galashiels: Electric Lighting.**—Messrs. Buchan and Partners, Consulting Engineers, of Edinburgh, have been appointed to advise the Council with regard to the provisional order now being promoted by the Galashiels and District Electric Supply Co. A number of petitions have been lodged against the Company's order, but most of them are merely to preserve a *locus* in the event of disagreements over details.

**London: Electricity Supply.**—The Bill of the County of London Electric Supply Co., as hinted in our last issue, in these notes, is likely to meet with considerable opposition from the London Borough Councils. It is stated that a defensive alliance is to be entered into in order to protect the Borough Councils from any action from outside sources which might be detrimental to their interests.

**Manchester: Purchase of Trafford Park Co.**—In spite of the adverse criticism which has been made recently concerning the proposal of the Corporation to purchase the Trafford Power & Light Supply, Ltd., the project was approved by a ratepayers' meeting last week.

**New Zealand: Lake Coleridge Power Plant.**—This power plant is anticipated to be in operation by May. The total capacity of the works will eventually be 9,000 kw., and supply will be given to Christchurch, and fifteen other local bodies, as well as to the Christchurch-Lyttelton suburban railway. At present about 6,000 kw. of plant has been installed.

**Oldham: Street Electric Lighting.**—At the last meeting of

the Electricity Committee, the Chairman moved that the Lighting Committee be asked to give more consideration to the use of electricity for street-lighting purposes. The resolution was carried.

**Surbiton: Electricity Undertaking.**—Mr. J. F. C. Snell has reported upon the position of the electricity undertaking, and a meeting is to be held at which representatives of Messrs. Callender's, who are managing the works, will attend to discuss the matter with the Electricity Committee and Mr. Snell.

**Taunton: Water Power Plant.**—A recommendation by the Main Drainage Committee that advice should be taken as to the utilisation of certain local water power for generating electricity was lost at the last Council meeting. The Borough Electrical Engineer expressed the opinion that any expense in this direction would be more profitable if devoted to the installation of extra steam plant in the existing power station.

**Teignmouth: Electric Lighting.**—We recently reported that the Council had decided not to undertake a municipal electric supply scheme, but to give facilities to a company. As a result, the Bovey Tracey Electric Light Co. has written concerning a possible supply in bulk, whilst Dr. Purves, of Exeter, is also negotiating with regard to a scheme.

**Worcester: New Plant.**—A new 2,000-kw. turbo-alternator set, manufactured by Messrs. Heenan and Froude, was put into operation at the power station last week. This plant, together with the necessary boiler-house extensions, has involved an expenditure of about £8,000.

**Yorkshire: Opposition to Power Co.**—The Yorkshire Electric Power Co.'s Bill, which proposes to take powers to distribute electricity in districts in its area where no provisional orders exist, is arousing considerable opposition from a number of urban district councils and rural district councils in the Company's area, and there are signs of a lively Parliamentary fight unless some agreement can be come to in the meantime. A large number of oppositions have been deposited at Westminster.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £66 10s. to £67. (Last week, £65 10s. to £66.)

**The "Z" Half-watt Lamp.**—The address of the "Z" Electric Lamp Manufacturing Co., Ltd., was incorrectly given in a note which appeared in our last issue. The Company's address is Orient House, New Broad Street, London, E.C.

**Agencies.**—The names of seven firms at Sydney (N.S.W.) who desire to obtain agencies for British electrical firms, are on file at 73 Basinghall Street, E.C.

**Change of Telephone Number.**—W. T. Henley's Telegraph Works Co., Ltd. (Blomfield Street, London Wall, E.C.), now has seven telephone lines, and the telephone number has been changed to London Wall 4560.

## NEW COMPANIES

**ELECTRICAL SERVICES.**—This Company has been registered in Bradford with a capital of £1,000. One of the subscribers is Mr. L. V. B. Burrows, Electrical Engineer, Horton Lane, Bradford.

**BRITISH CENTRAL ELECTRICAL CO.,** 6-8 Rosebery Avenue, E.C. Capital £3,000. To take over the business of the British Central Electrical Co. now carried on by E. S. Conradi and J. F. Conradi.

**TRANS-OCEANIC WIRELESS TELEGRAPH CO.,** Marconi House, Strand, W.C. Capital £200,000. To acquire from Marconi's Wireless Telegraph Co. certain lands and rights in the counties of Carnarvon and Merioneth, together with the wireless telegraph station now in course of erection there, and the sole licence to use the Marconi system between Great Britain and certain stations in the United States. First directors are G. Marconi, Godfrey Isaacs, Captain H. R. Sankey, and M. A. Braunstein.

**INDIAN RAILLESS TRACTION CO.**—Capital. £5,250. Registered by Jordan & Sons, 116 Chancery Lane, W.C. To carry on in India the business indicated by the title.

**COLSTON ELECTRICAL WORKS,** 9-10 Denmark Street, Bristol. To take over existing business of Messrs. Parfitt, Webber and Co.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 370 [VOL. X., No. 5]

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THURSDAY, JANUARY 29, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL and PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Wireling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE fact that the Bradford Corporation has placed an order for a 5,000 kw. turbine with a Berlin firm has given rise to much comment. It is stated that the tender was not the lowest, and that the British manufacturers, while willing to accept the penalties for steam consumption higher than that guaranteed, required a wider margin before absolute rejection of the machine on this account. (Page 58.)

THE Electrical Trades Union is increasing in strength and confidence, and at a meeting of workmen held at Caxton Hall on Tuesday night, at the invitation of the London Electrical Masters' Association, a resolution was passed referring the appointment of delegates to meet the masters to the Union, in conjunction with the Association of Central Station Engineers. The electricity supply workmen, we believe, however, have no real desire to be concerned in the present dispute. (Page 59.)

A FEW more letters from central station engineers, with regard to the prospect of the half-watt lamp in their districts, appear on page 60.

A LETTER from a well-known maker of arc lamps objects to the suggestion that half-watt lamps will supersede arc lamps for street lighting. (Page 60.)

AT the annual dinner of the British and Allied Manufacturers' Association, Mr. F. E. Smith spoke in strong terms on the award of the tender for the new Bradford turbo-alternator to a German firm. (Page 61.)

THE annual report of the B.E.A.M.A., passed last week, records considerable activity in several useful directions. (Page 61.)

MR. A. H. SEABROOK's statement in his address to the "Point Fives," that 6d. per unit for lighting was a competitive price with gas at 2s. 6d. per 1,000 cub. ft., was challenged in the discussion. The author gave it as his experience that it was possible to obtain even 8d. One reason why the rateable value basis was better than the "connected load" basis was that inspections were unnecessary, and another reason was that even if the lamp efficiency was improved the lighting income would be maintained. Some districts now have an all-night heating load. (Page 62.)

SOME effects observed when the rotor of a three-phase induction motor has a loose connection are discussed in our "Questions and Answers" columns. (Page 62.)

DURING Mr. A. A. Campbell Swinton's Inaugural Address to the Wireless Society of London messages were received from the Eiffel Tower on an aerial erected for the purpose. The received energy worked a Brown relay, which in turn worked two others, and finally the message was written by a syphon recorder, and, by means of a Lietz Projector, the actual working of the apparatus was clearly shown on the screen.—We refer also, under "Telephony and Telegraphy," to the magneto switchboards which are supplied with combined jacks and indicators by the Peel Conner Telephone Works.—Some notes are also given on a new publication dealing with the quenched spark system of wireless telegraphy for ships developed by Siemens Bros. & Co. (Page 63.)

OUR "ELECTRICAL ENGINEERING Literary Section" contains a list of new publications, reviews of a number of technical books, and gives a selected list of recommended works on all branches of electrical engineering. (Page 64.)

PATENT No. 2,222 of 1900, by A. Wright and The Reason Manufacturing Co., for a construction of electrolytic mercury meter expires during the week after a full life. A patent for winding a number of coils simultaneously on a common core, by J. Scott, R. Varley, and J. S. Anderson, also expires after a full life. The specifications published last week include one for starting synchronous motors by E. Rosenberg, one for a construction of filament and spider for metal filament lamps by H. Zschocke, and one dealing with trolley omnibuses for running on tramway tracks by E. Cross. (Page 69.)

A DESCRIPTION is given of some new fittings specially designed for half-watt lamps. (Page 70.)

MR. B. M. JENKIN is retiring from the firm of Kennedy and Jenkin. (Page 71.)

CONSIDERABLE extensions to generating plant and



mains are contemplated at Huddersfield, Belfast, Liverpool, Gravesend, Aldershot, and by the Yorkshire (W.R.) Electric Tramways Co.—Various stores are required by a large number of electricity departments. (Page 71.)

THE General Electric Company, Ltd., in connection with Messrs. Pirelli, Ltd., are erecting a large cable works in Southampton for the manufacture of all classes of cable. It is expected that manufacture will commence in May or June. (Page 72.)

THE Glasgow Electricity Committee is considering the hiring out of cookers and other domestic electrical appliances.—Tests of electricity and gas for street lighting are being carried out at Leicester.—Vibration is alleged from the Diesel engines at the Aldershot electricity works.—A special report is to be drawn up on the financial position of the Southampton Electricity Department. (Page 72.)

### ARRANGEMENTS FOR THE WEEK

FRIDAY, JANUARY 30TH.

*Institution of Electrical Engineers: Newcastle Section.*

7 p.m. At Hugh Bell School, Middlesbrough. "Reactance and Reactance Coils in Power Circuits," by E. P. Hollis.

SATURDAY, JANUARY 31ST.

*Association of Mining Electrical Engineers.*

5.30 p.m. Warwick and S. Staffs Branch. At Imperial Hotel, Birmingham. "Practical Notes on Colliery Electrical Equipment," by J. F. Aust.

TUESDAY, FEBRUARY 3RD.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "Rotary Converters," by E. C. H. Slater.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At Princes Street Station Hotel, Edinburgh. "British Practice in the Construction of High Tension Overhead Transmission Lines," by B. Welbourn.

THURSDAY, FEBRUARY 5TH.

*Institution of Electrical Engineers.*

7 for 7.30 p.m. Annual Dinner at Hotel Cecil.

### The London Electrical Engineers.

(TO-DAY) THURSDAY, JAN. 29TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, JAN. 30TH.—D. Company. Special Class on Crossley Engine, 7 to 8 p.m. Technical Instruction, 7.30 to 9.30 p.m.

SATURDAY, JAN. 31ST.—Headquarters open from 10 a.m. till noon.

MONDAY, FEB. 2ND.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, FEB. 3RD.—B. Company. Technical Instruction, 7 to 10 p.m.

WEDNESDAY, FEB. 4TH.—Recruits only. Recruit Instruction and Technical Instruction, 7 to 10 p.m.

THURSDAY, FEB. 5TH.—C. Company. Technical Instruction 7 to 10 p.m.

FRIDAY, FEB. 6TH.—D. Company. Technical Instruction, 7 to 10 p.m.

SATURDAY, FEB. 7TH.—Headquarters open from 10 a.m. till noon.

### THE GERMAN TURBINE FOR BRADFORD

THE Bradford Corporation has accepted the tender of the Adnil Electric Co., Ltd., for a Bergmann turbine of 5,000-kw. capacity at 0.8 per cent. power factor, capable of standing an overload of 25 per cent. for two hours, and running at 1,500 r.p.m. The turbine is to be made in Berlin. We understand that the specification demanded certain steam-consumption guarantees, but that it was open in respect to the type of turbine, it being left to the contractor to tender for either an impulse or reaction type, and for a speed of 1,500 or 3,000 r.p.m. The amount of the accepted tender was £9,370. Visits were paid by a deputation from Bradford to inspect large steam turbines on the Continent, and also to inspect the Bergmann works in Berlin before the order was placed.

There has been much comment upon the matter, both locally in Bradford and in electrical engineering circles generally, and it is openly stated that the accepted tender was not the lowest. Considerable reticence, however, is being maintained as to the exact facts. We believe that some difference of opinion arose as to the margin to be allowed in steam consumption from the specified guarantees. Heavy penalties were to be enforced should the machine not come up to guarantee in this respect, and we understand that these were accepted by all the firms tendering, whether British or Continental. The British firms, however, insisted on a margin of 10 per cent. before absolute rejection of the machine, while the successful tenderer was satisfied with a smaller margin. The matter was referred to in Mr. F. E. Smith's speech at the B.E.A.M.A. dinner, reported on another page of this issue.



**EXPERIENCED WIREMAN** (to young and enthusiastic Trade Unionist):—Not so much of your Caxton Hall manner with me, young man. You may get a rise, but you won't get 11d. an hour yet awhile, and I know you don't expect it. And, take my advice, leave the central station workmen alone; they won't thank you for making trouble,—you and your pictures of arc lamps off the scrap heap and toy dynamos.

## THREATENED STRIKE OF ELECTRICAL WORKERS

THE situation has assumed a new aspect, after the meeting held at Caxton Hall on Tuesday night, a report of which, as well as a report of a meeting of the Electrical Trades Union on Monday, appears below. It would appear from the voting at the meeting at Caxton Hall, that among the workmen employed by the wiring firms represented in the London Electrical Masters' Association, there is now a preponderance of men who are either members of the Electrical Trades Union, or are in sympathy with it. This need not be taken absolutely for granted, however, as there are several firms employing non-union workmen who did not take steps for representatives of their men to be chosen to attend the meeting. It is not quite clear what significance is to be attached to the statement made by Mr. Tate, the Secretary of the Masters' Association, that he "accepted" the Trade Union amendment, but the effect of the amendment is clearly that the Electrical Trades Union and the Association of Central Station Engineers will appoint representatives whom they will confidently expect will be invited to meet the Masters in conference on the wages question. It is greatly to be regretted that an endeavour is being made to drag in central station workmen, who have nothing at all to do with the present dispute in the building trades, and have at present shown no sign of discontent. The majority of the central stations in London, for the latter reason, did not post up the notices inviting their workmen to appoint delegates to Tuesday's meeting, and the Association of Central Station Engineers, which was not originally formed as a workmen's union, is still a body of more or less technical engineers rather than of workmen, although apparently some of the forward spirits would have no objection to its developing into a "fighting organisation." The membership is composed of shift, sub-station, mains, and charge engineers; it does not include meter readers, jointers, or arc-lamp men. The total membership, all over the United Kingdom, is 1,500, of which 450 to 500 are in London; the charge engineers, &c., in the municipal stations are well represented on it, and also a good many men, we are told, in the railway power houses, but so far the Association has not been as successful in enrolling numbers of men from the supply company's stations.

The meeting of the Electrical Trades Union was held at the Memorial Hall, Farringdon Street, on Monday night. Non-unionists were invited, with the object of explaining to them how their status and rate of wage might be improved. The meeting was to have been presided over by Mr. S. Stennett (Chairman of the London Building Industries Federation), but owing to the lock-out by the London Master Builders' Association he found himself too busy in other directions, and the Chair was taken by Mr. J. Buchan (District President of the Electrical Trades Union). There were probably nearly 1,000 workmen present.

At the outset the Chairman said that as the meeting was composed of both unionists and non-unionists, it was not intended to go into any definite attitude of policy in the present dispute. All they desired to do was to endeavour to convince the non-unionists that without organisation it was absolutely impossible for the human race to progress at all. Speeches enlarging upon this point of view were also made by Mr. J. Potter (District Secretary of the Electrical Trades Union), Mr. C. W. Bowerman, M.P., Mr. J. Kinniburgh (Organising Secretary of the Electrical Trades Union), Mr. J. Stokes (Chairman of the London Trades Council), and others, and in the course of these speeches it was said that the object now being aimed at by trade unionist leaders is to federate all the unions into one in order to make it impossible for any man to get a job unless he is a member of the Union.

With regard to the dispute between the electrical workers and the electrical employers of London, and the new card of Working Rules set out on page 45 of our last issue, it was pointed out that this is merely a commencement, and that the ultimate demand will be for 1s. per hour for electrical wiremen. The London electrical contractors in general, and those on the Committee of the London Electrical Masters' Association in particular, naturally came in for severe criticism, and special mention was made of the firms of Blackburn, Starling and Co., Duncan Watson and Co., and Taylor and Co., whilst

to the whole body of electrical employers the term "unscrupulous" was freely applied. In reference to the meeting called by the masters for the following night, a hint was given to the men that they should try to prevent the passing of the resolution to form a committee consisting of twelve employees and twelve employers, for the reason that the men's representatives might not in that event consist of union officials. Equally severe was a criticism of Mr. Leonard Tate in regard to his suggestion of the grading of workmen with a graduated scale of wage, and the possibility of the Union holding up every form of electrical work was suggested if anything like a large percentage of electrical workers in London can be got into the Union.

The following resolution was put to the meeting and carried unanimously:—

"This mass meeting pledges itself to support the Electrical Trades Union to enforce the wages and conditions which have been placed before the employers in our trade card."

The mover of the resolution pointed out that the proposed increase from 9½d. to 11d. an hour for electrical wiremen represented 3s. 10d. per week of fifty hours, which amounted to 87 per cent. of the 168 per cent. increase in living expenses since 1900, whilst it was hoped that, as the strength of the Union increased, it would be possible to demand the remaining 81 per cent. deficiency from which it was alleged the men are now suffering.

Two interesting pieces of information were announced during the evening. One was that the membership of the Union is 1,600, whereas the Organising Secretary thinks it should be between 4,000 and 5,000, and the other was that the whole of the employees in the Electricity Department of the St. Pancras Borough Council have joined the Union. The tone of the speeches was singularly uneven, for whereas Mr. Bowerman and one other speaker counselled the men to go about their self-imposed task in an orderly manner, the Chairman unfortunately urged the men to proceed on the lines of getting as much as they can and giving as little as possible in return. The inference to be gained from the speeches of the leaders of the men is that their lot will be thrown in with that of the building trade generally, and that none of the men employed where building work is in progress will return to work unless all sections have their demands satisfied.

The meeting convened by the London Electrical Masters' Association on Tuesday was for the purpose of bringing together representatives of unionist and non-unionist workmen, with a view to forming a workmen's committee of twelve to meet a similar committee of the masters.

Mr. J. H. BOWDEN (Borough Electrical Engineer, Poplar) was in the chair, and some 150 workmen's delegates were present, in addition to a considerably smaller number of representatives of the masters. The delegates represented both wiring contractors and (to a very limited extent) supply station men.

Mr. LEONARD TATE (Secretary of the London Electrical Masters' Association) proposed the following resolution:—

"That a Committee of Workmen's Representatives be appointed consisting of twelve members (not more than one representative from any one firm) to meet the Committee of the London Electrical Masters' Association with a view to agreeing Working Rules, and terms and conditions of employment."

As was anticipated, the trade unionist workmen, who were considerably in the majority, refused to accept the resolution, and, indeed, they had been instructed by the Electrical Trades Union not to elect union men to sit on any committee which also contained non-union men. On behalf of the Union an amendment was proposed, which was finally carried in the following form:—

"That the resolution put forward by the London Electrical Masters' Association be referred to the Electrical Trades Union and the Association of Central Station Engineers."

Before this was put to the meeting it was indicated that a number of non-unionists who were present were also in favour of, and would vote for, this amendment.

So far as the representatives of the Masters' Association who spoke were concerned, the impression given by speeches from Mr. W. R. Rawlings, Mr. G. E. Taylor, and Mr. Duncan Watson was that they are only too anxious to meet representatives of the men with a view of considering the question of an increase in wages, and that although many of the contractors in London have been severely criticised for employing non-union labour, it is the invariable practice not to inquire of the workmen whether or not they are union men, and at the same time to pay them the rate of wage, irrespective of any minimum fixed by the Union, which their usefulness to their firms entitles them to. The point in dispute has always been the difficulty with regard to the position of non-union men, whom the masters do not wish to see forced out of the trade by any action of the Union, and although the Union men frequently cheered when the masters stated they were prepared to pay Union rates to a good man, this does not clear away the difficulty, as the subsequent proceedings clearly showed that the aim of the Union is to prevent any non-union men from working on any building job in London. Indeed, the mover of the amendment to the resolution told the masters quite plainly

that in fighting the Electrical Trades Union on this point they were also fighting the whole of the building trade in London, with whom the Union was working.

Towards the close of the proceedings, when the amendment was being put to the meeting, considerable discussion took place as to what was actually intended.

Mr. TATE said that when he put this resolution before the meeting he had assumed, in the innocence of his heart, that union and non-union men would have an equal chance of sitting on the proposed Committee. He had, however, been informed by a responsible member of the Electrical Trades Union that if the original resolution were carried, no union men would be allowed to sit upon the Committee. He was exceedingly sorry to hear this, and in the circumstances he had consulted with the Chairman, and felt they had no alternative but to accept the amendment. He took it that Mr. Muir, the mover of it, wished to refer the masters' resolution back to the place whence it came, i.e., the Masters' Association, and to couple with that the other two organisations, namely, the Electrical Trades Union and the Association of Central Station Engineers.

Mr. MUIR said that asking for non-union men to be upon the Committee was only asking for war. The Electrical Trades Union now had 1,800 members enrolled, and as the representative body it could not recognise rules drawn up by any Committee containing non-union men.

Mr. TATE said that, as he had pointed out before, this attitude forced the masters into accepting the amendment, but at the same time he would like to know if the Union would be prepared to have on this Committee representatives from firms employing non-union men.

Mr. MUIR said that as a District Committeeman of the Electrical Trades Union he could not possibly give any undertaking. The masters must resume negotiations with the responsible body.

The CHAIRMAN then desired to put the amendment in the following form:—"That the resolution put forward by the Electrical Masters' Association be referred to the Electrical Masters' Association and the Electrical Trades Union."

Mr. MUIR said he could not accept that. He wished to refer the masters' resolution to the Electrical Trades Union and the Association of Central Station Engineers.

Mr. TATE said he had not understood that.

Mr. MUIR said that, according to the rules of the Union, all negotiations in relation to finance of the Union must be carried on through the Executive Committee.

The CHAIRMAN: You mean that the resolution put forward by the masters should be referred to the two organisations, the Electrical Trades Union and the Association of Central Station Engineers?

Mr. MUIR: Yes.

As stated above, the amendment was then put and carried by a substantial majority.

## PROSPECTS OF THE HALF-WATT LAMP

WE have received a few more letters from Supply Station Engineers in various parts of the country, in reply to our inquiry as to the prospects of the half-watt lamp in their districts. Extracts from previous letters were published in our issues of January 15th and 22nd.

LANCASTER.—MR. G. C. MILNES thinks it probable that the half-watt lamp will have a considerable effect on the street-lighting problem in Lancaster, and that there is also a field there for the use of these lamps for outside shop-lighting. Lancaster has just recovered from the effect of the introduction of the tungsten lamp, but will give the half-watt lamp a hearty welcome, particularly down to the 200 c.p. units.

BISPHAM-WITH-NORBRECK.—MR. J. S. HOLLINRAKE points out that this was one of the stations which was made possible by the introduction of the one-watt lamp. They have in only two years connected up 160 houses out of a total of about 600, but with the carbon filament lamp it would have been madness, he says, to have installed the plant, and to have competed with gas there. If they were to get the half-watt lamp in the smaller sizes, the reduction of the output would only be temporary.

DARTFORD.—MR. J. D. PEMBER writes: "In a town of moderate size such as Dartford, largely inhabited by the working classes and possessing no large shops, the present price of the half-watt high-voltage lamps will be prohibitive. For £2 one can get a miniature arc lamp, and a couple of these will light a Dartford shop window; or a cluster of, say, three 100 c.p. M.F. lamps will be equally as effective, and much cheaper in first cost. Then the renewals are so much cheaper that the consumer can afford to pay rather more for current supplied than if he used the half-watt lamps. In these smaller towns it is getting quite a moot point as to whether it pays to couple up the smaller lighting consumers at all, even with one watt per c.p. lamps installed. A single fault on a main, or a faulty length of main, may cost more to repair than the total yearly

receipts from the consumers connected thereto. I have at present to re-lay 70 yards of main originally laid too deep in the roadway, so that it is below the level of the high tides, and consequently often water-logged, and on this main is one small consumer only, whose total annual bill is less than one-fifth the cost of relaying this length of distributor."

WILLESDEN.—MR. A. W. BLAKE welcomes the half-watt lamp, but does not anticipate any effect on his load until there has been a substantial reduction in the cost. In the sizes now available he sees no advantage in comparison with good flame lamps except for isolated positions, owing to the running cost of the latter being very much lower, especially as he estimates the efficiency of the half-watt lamp as 0.75 watts per candle, after "toning down."

GRIMSBY.—Some words were accidentally omitted in quoting from Mr. W. A. Vignoles' letter in our issue of January 15th. Mr. Vignoles said: "I find it extremely difficult to get my customers to pay sufficient attention to arc lamps to ensure satisfactory results." The words which we have italicised were those omitted.

## CORRESPONDENCE

### HALF-WATT LAMPS.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—From the numerous letters appearing in your two last issues giving the opinions of engineers as to the probable value of the new half-watt lamp for electrical uses, we notice a great tendency on the part of a number to hail the newcomer with an enthusiasm which certainly it does not deserve in the cases, as it refers generally to the displacement of flame arc lamps, and particularly to those used for street lighting and for such similar work. A similar impression seems to prevail in other quarters, for even in one of your contemporaries we notice an editorial article dealing with this matter, from which one can only assume that the arc lamp is to be regarded as being upon its last legs. We can only suppose that those who have so rashly stated their views have not fully considered the matter, and in consequence we think you will allow us, as magazine flame arc lamp manufacturers of the latest and most improved type, to protest against this destructive criticism, which will not bear the light of actual fact.

Simple calculation of the various factors of cost for comparing the one system of lighting with the other will quickly show that the modern flame lamp has no fear whatsoever of being superseded in any instance where cost of light delivered is the determining factor, as is now universal in the most important work. The renewals, &c., of the half-watt lamp cost more than the carbons, trimming, attendance, depreciation, and interest on capital of the flame lamp; and, again, the cost for energy of the latter for equal candle-power is one-third to one-fifth of that of the former. To those who may care to calculate this last item at one halfpenny per unit only will find that the production, say, of 3,000 candle-power for an assumed year's burning of 4,000 hours will result in a saving of several pounds per annum in favour of the arc lamp.

We are far from saying that the half-watt is unsuitable to replace the arc lamp, for in some cases it is only too obvious that it will do so, and particularly is this the case where the high efficiency is not desired. The one-watt lamp, however, we believe has tapped this field already, and whilst the half-watt lamp may still further slightly encroach on the arc lighting field, it seems to be more a probability that the half-watt, if it be made in suitable sizes, will be likely to replace the one-watt lamps as now used for less important street and similar lighting than the arc lamp. Many seem to regard the new lamp as a new weapon to fight the high-pressure gas; candidly, from our own experience in severe competition with gas in street lighting, we consider it will require a lamp having a higher efficiency than one of half a watt per candle to defeat the enemy in these cases, and there is no lamp we know of other than the modern magazine flame arc lamp that has a sufficient margin in hand to ensure a successful competition. In conclusion, we hope in the interests of all concerned that a sane view will be formed in good time as to the sphere in which the new lamp may usefully be employed, for the sooner this is realised by manufacturers and users the sooner will the various electrical interests settle down and work for the good of the industry as a whole.

Yours faithfully,

OLIVER ARC LAMP, LTD.,

CHARLES OLIVER, Director.

University of Liverpool.—The prospectus of the Engineering Faculty of the University of Liverpool for the session 1914-15 may now be obtained on application to the Registrar, Mr. E. Carey. The session will begin on October 8th. The head of the electrical engineering department is Professor E. W. Marchant, and Professor J. A. F. Aspinall is lecturer in railway engineering.

## THE B.E.A.M.A. DINNER: Mr. F. E. SMITH ON THE BRADFORD TENDERS

THE annual dinner of the British Electrical and Allied Manufacturers' Association was held at the Savoy Hotel, on Wednesday last week, under the presidency of Lord Amthill.

Mr. A. BRUCE ANDERSON (Chairman of the Council), proposing the toast of "The Guests," said, in the course of his speech, that it was difficult to arrive at agreements with other responsible sections of the industry if individuals whose ideas coincide neither with those of the Association nor of the leaders of their own bodies took independent action. He regarded, however, the hearty co-operation of manufacturers as only one step in the direction of a consolidated industry able to protect and foster the vast interests committed to its charge. While there were points at which the immediate interests of various sections of the industry did not coincide, one had to travel but a little way to find a point where the interests of all were identical. He looked forward with confidence to the time when the industry would unite to educate the public in the increased use of electricity, both for purposes for which it was now used and in directions where we have at present made little or no advance. He was aware that there were some difficulties to be overcome. For instance, if the electrical industry contemplated a national propaganda such as is indulged in by their gas friends, one of the most important sections of the industry, namely, the municipal supply authorities, were hampered by restrictions which would prevent the large majority of them from taking part in it. The Manufacturers' Association intended to help the municipalities to get these disabilities removed. The manufacturers would doubtless be called upon, and he thought would be wishful, to take part in such a national propaganda, but what guarantee had they that if, as a result of joint efforts, additional plant and machinery was required, the orders would not go outside the Association, or even outside the country? The placing of orders abroad was embarking upon a policy which, if indulged in by everyone, would destroy the very market upon which they all lived, and be nothing short of national suicide.

Mr. F. E. SMITH, K.C., M.P., who responded first on behalf of the guests, was in his most ironical vein. He said that Mr. Anderson had spoken as though it were a misfortune if contracts which could have been carried out in England were given to manufacturers abroad. This was one of the most elementary fallacies: they had been told so for a very long time, and by persons of the highest possible authority. Surely Mr. Anderson must have forgotten that even if a big contract, say £100,000, which ought to have been carried out in this country, were given to Germany, although that £100,000 represented, perhaps, £60,000 in wages for Germans, it followed as an inexorable economic law that Germans must buy something from us. He had read that day that the Bradford Corporation had provided at a cost of £10,000 a generator for the electricity works. Several British firms sent in lower tenders—that, of course, was their ignorance and incompetence—but it was stated that the German plant was so much superior to the British that the Council had to accept the German contract. £7,000 of the contract probably represented wages. Some of them might think it was unfair, and that the money ought to have gone to those who are building Dreadnoughts to defend this country, and not to those who were building Dreadnoughts to destroy this country. If anyone thought that this was wrong, he did not grasp the elements of political economy. Although that contract had been lost to a firm of British engineers, although it was true that if the contract had been given to a British firm the wages would have been paid in this country, and the profit which would have been made would have gone in the discharge of the rates and taxes, they had forgotten that if they only bought those things from Germany she might buy something else which some other body of manufacturers made in this country, or she might even give her order in the shape of some raw material which, when developed in Germany, would be sent back here to be sold. Passing from irony to equally biting sarcasm, Mr. Smith then pointed out that Germany had virtually Free Trade for its own 70 million inhabitants and in our country as well, while we had only Free Trade in the United Kingdom—including Bradford. In conclusion, he deplored that the question of tariffs should be a party question.

Mr. DUDDELL, F.R.S. (President of the Institution of Electrical Engineers), who also responded, referred to the prospects of electricity as a means of improving agriculture by augmenting the production of crops.

Lord GEORGE HAMILTON, who proposed the toast of "The Association," said that the English engineer could boast that what he made was equal, if not superior, to the products of the foreign manufacturer, and, even if the price was higher and the quality only equal, the contract should go to the Englishman. He mentioned also the gift of £5,000 worth of instruments made by members of the Association to the Hong Kong University, and referred to at the time in our columns, and this was also alluded to by Lord AMPTHILL as an act of patriotism to ensure the good reputation of England in the Far

East. Lord Amthill also suggested that the Association should use its influence to see that an inquiry was held into the partial disuse by the Admiralty of electricity for certain purposes on battleships.

## REPORT OF THE B.E.A.M.A. COUNCIL

THE Annual Report of the British Electrical and Allied Manufacturers' Association was passed at the Association's General Meeting on Wednesday last week. Dealing with the position with regard to the standardisation of General Conditions of contract as between the manufacturer and purchaser of heavy plant, it is stated that an early agreement is looked forward to between the Association and the Institution of Electrical Engineers (the I.M.E.E. is not mentioned in this connection). Two draft sets of standard conditions of sale to govern smaller commercial and industrial transactions have also been put in circulation. Three agreements with regard to the methods to be followed in cross-tendering as between makers of steam and Diesel engines, turbines, dynamos, and condensers have had further adherents during the year; and a fourth, between gas-engine builders and dynamo makers, awaits the consent of certain of the former firms before coming into operation.

Reference is also made to the standardisation rules for electrical machinery provisionally put into circulation by the Association (referred to in ELECTRICAL ENGINEERING of May 22nd last, p. 285) pending further action by the Engineering Standards Committee, with whom the Association is co-operating closely. The standardisation of meters, and also of accessories (the latter including three-plate ceiling roses, and wall sockets and plugs, for lighting, heating, and cooking) is also in a forward state. The Committee of the Switchgear Section has given attention to the subject of electrical symbols as a basis for further standardisation, and has also to its credit the provisional settlement of many differences which previously existed as between manufacturers and purchasers and the Home Office inspectors. Two deputations waited on Mr. G. S. Ram, and it is stated that a settlement of all difficulties relating to the interpretation of the present Factory Regulations has been obtained, and that a full report will be circulated shortly. Other activities of the Council included negotiations with the Commercial Intelligence Department of the Board of Trade with regard to the annual statistical analysis and summary, successful deputations to the railway managers with respect to the classification of electric heating stoves, and another relating to switchgear.

The removal of handicaps to members' trade in Canada has been referred for expert opinion, and the Council hope that further progress can be reported within a reasonable time. Inter-trading between members of the Association is being strongly recommended, and detailed arrangements are under discussion by the various sections. The subject of the Association's patronage to municipal exhibitions has been placed on a definite footing by the creation of a Joint Committee of the I.M.E.E. and the Association. Reference is also made in the report to the gift of instruments to the Hong Kong University.

The five Members of Council retiring by rotation were unanimously re-elected.

**L.C.C. Loan Periods.**—A conference of London Borough Councils owning electricity works will be held shortly in order to discuss the present attitude of the London County Council with regard to the repayment of loans upon electricity works.

**Revocation of Power Company's Act.**—The Board of Trade has revoked the Cumberland Electricity and Power Gas Company's Act of 1906. This is one of the few cases in which the Board of Trade has been compelled to revoke the whole of a power company's powers; and it is to be particularly regretted in this instance, because, as pointed out in ELECTRICAL ENGINEERING, Vol. I., p. 111, a very interesting scheme for the use of power gas in the generation of electric power had been contemplated, the idea also being to supply gas to large consumers of electrical energy who preferred to instal their own generating plant.

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members and transfers from one class to another at the meeting on Thursday:—*Members*:—C. L. Fortescue, J. McFarlane Kennedy. *Associate Members*:—Capt. Llewellyn Evans, R.E., L. F. Fogarty, L. Gillitt, A. G. Stamato-poulos, G. F. Tanner. *Graduates*:—S. D. Pahwa, E. Walker, R. Wilson-Jones. *Students*:—A. J. Bailey, G. R. Boscolo, J. T. Bromley, R. Burleigh, H. Eastman, S. Ethelston, W. L. Giller, W. C. J. Halford, A. D. Hedgecock, M. R. James, E. C. Johnston, S. G. Killingback, R. F. J. Maidment, J. Mould, P. R. Nath, A. C. Norman, H. P. Organ, S. Pendlebury, M. A. Rashid, E. H. Vick, E. J. Wilcock, S. L. Wong. *Candidates Transferred*:—*Associate Member to Member*:—A. M. Coombs. *Student to Associate Member*:—J. C. Connan, S. M. Hills, O. Howarth, G. W. P. Page, T. F. Phillips, J. C. Rennie, B. Snowball. *Student to Graduate*:—E. G. Grant, P. G. Spary.



## THE RATEABLE VALUE RESIDENCE TARIFF

**D**URING the discussion on Mr. A. H. Seabrook's address to the "Point Fives" on January 16th, at "Tricity" House (ELECTRICAL ENGINEERING, January 22nd, p. 46), it was contended that the "connected load" basis for assessing the primary charge was the most satisfactory for premises other than residences. The author agreed. It was also suggested that the author advocated the principle of "get as much as you can from consumers." In reply to an objection that 6d. per unit for lighting was not a competitive price with gas at 2s. 6d. per 1,000 cub. ft., Mr. Seabrook said that he had in his area hundreds of large and small consumers paying 6d. per unit on the alternative flat rates, and that it was quite possible to get even 8d. However, in spite of that, during the past year or so no consumer was charged more than an average of 6d., whatever his rate worked out at on either the telephone system or the Wright maximum demand system. In reply to a further question as to why he now advocated the rateable value system of charging, he said that on this system any contractor or any consumer could calculate out for himself in half a minute what his annual charge was going to be. This simplicity would help business-getting. On the "connected load" basis each consumer had to be separately quoted by the supply undertaking, causing delay and complication. Another point was, the "connected load" basis necessitated inspections, and inspections were both irritating to the consumer and expensive to the undertaking. A third point was that the rateable value basis would maintain the lighting income, even if lamps were very much improved in efficiency. One speaker advocated the hiring out of cookers at very low rates, or even supplying them free to the consumer, and charging a higher rate for the current. The author pointed out that this was good from the manufacturers' view, but was quite unfair to the consumer who bought his apparatus. Another speaker mentioned that considerable all-night heating loads in residences had actually come about owing to a reasonable competitive rate being charged, and Mr. Seabrook said that an all-night heating load of about 200 kw. had come under his observation during this winter.

The next meeting will be held on Friday, April 17th, under the chairmanship of Mr. J. W. Hame, of York.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,376.

In high-tension A.C. motors, trouble is often encountered through the insulation breaking down on the coils nearest the terminals, due to the high initial voltage on switching in. Describe fully arrangements which are used, and have been found satisfactory in practice, whereby this trouble can be overcome. "G. T."

(Replies must be received not later than first post, Thursday, February 5th.)

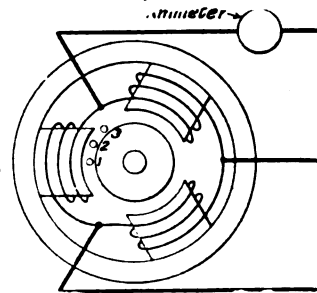
### ANSWERS TO No. 1,374.

When an induction motor develops a loose connection in the rotor, the ammeter will be caused to set up a periodic swing. It is desired to know the relationship which exists between this swing, the frequency, and the number of poles. Explain fully what causes the swing.—"DUD."

The first award (10s.) is made to "MARF," who writes as under:—

The swinging of the ammeter needle is caused by an increased current which is continually altering in phase,

relative to the main current in the stator coils. This alteration in phase occurs as explained below, and is due to the "slip" between the rotor and the rotating field induced by the stator coils. Referring to the accompanying sketch. Assume that at any time the loose conductor on the rotor is in position 1. The mutual induction between the stator coil A and the rotor will be reduced. Consequently more current will be indicated on the ammeter.



A period later the conductor will have moved round into the position 2 (slightly behind its former position owing to "slip"). After another period it will be in position 3, and so on, until ultimately it will be in its original position (1) at the commencement of a period. The above process then recurs. The current variation observed on the meter is now easily explained. When the "extra current" is in phase with the main stator current the needle reaches the top limit of its swing. When the phase difference is 90°, the needle is in its mid-position, and when the difference reaches 180° the needle is indicating the lowest value. From this it can be seen that the "swing period" of the needle will be the time taken for the rotor to "slip" one revolution relatively to the revolving field; or in the case of a six-pole three-phase machine, one-half revolution. If  $p$  = supply frequency,  $n$  = number of poles, and  $k$  = percentage "slip" of rotor, we get—Time for one swing of ammeter needle =  $1/p \{ p \times p(100-k)/100 \} \times 3/n$  secs. for three-phase motor; or  $1/p \{ p \times p(100-k)/100 \} \times 2/n$  secs. for two-phase motor. Thus the time of swing is proportional to the frequency and inversely proportional to the number of poles.

The second award (5s.) is made to "A. G. R.," who includes in his reply the following:—

If a polyphase induction motor with wound rotor and slip rings is running with one or more of its secondary circuits open so that but a single circuit in the rotor is closed, it will be found that the motor will operate at approximately one-half speed and develop considerable torque. With increase in torque the speed will fall off as in the case of the polyphase motor running at full speed. This action may be explained by resolving a single-phase field into two oppositely rotating fields. When the rotor or secondary, with but a single circuit closed, is rotated at half-speed, the current induced in it is at half the frequency of the primary current. This single-phase current sets up a single-phase field, of half the primary frequency, which can be resolved into two rotating fields moving in opposite directions. As the rotor is travelling at half the speed of the primary or stator rotating field, and as the frequency of the secondary circuit is half that of the primary, it is evident that one of the resolved secondary fields has a resultant speed equal to that of the primary field, and in the same direction. The other secondary resolved field has a resultant speed which is zero, i.e., it is stationary with respect to the primary or stator windings, and can have no effect on them. This should, therefore, be a position of zero torque, and the motor should have no tendency to rise above it. If the motor is now loaded it will tend to fall off in speed, and will develop considerable torque up to some maximum, and if loaded beyond this value of torque the speed will fall off. This motor runs at half speed or lower, practically in the same way as the ordinary polyphase motor runs at full speed and below. At exactly half speed one of the fields, as stated before, is at a standstill with respect to the stator windings. As the motor slows down under load this field will be moving with respect to the stator windings, and will evidently generate E.M.F.'s in them which will increase in value as the motor slows down, due to increasing load. The interaction of this field upon the primary circuits may give rise to some very complex conditions, such as increased currents (which are sometimes very heavy) in the primary circuits, a periodic swing of current, &c., and the motor will operate at a very poor power factor.

## ANSWERS TO CORRESPONDENTS

**PHASE.**—Mr. C. G. Morley New writes:—A. G. R., in his answer to Question 1,373, has confused the Board of Trade Regulations regarding earthed conductors with the earthing of the lead sheathing. The fact that it is proposed to use the lead sheathing as a conductor would of course bring it under the regulations referred to.

**DISPUTANT.**—The correct spelling is Leclanché, and the pronunciation something like Leklanshey, with the accent on the second syllable. Leclanché was a Frenchman.

**CHOKER.**—A 25/20-volt auto-transformer, which is similar in principle to a choking coil, will meet your requirements.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

An interesting Address was given on January 21st by Mr. A. A. Campbell Swinton to the Wireless Society of London. Mr. Campbell Swinton is the first President of the Society, and the meeting was the first since the constitution, aims and objects of the Society were definitely decided upon. It was held in the Lecture Theatre of the Institution of Electrical Engineers, and this was filled to its utmost capacity. An aerial was erected on the roof, and arrangements were made to receive a message from the Eiffel Tower. This was received on a syphon recorder, and the movements of the pen marking the strip were clearly shown on the screen by the use of a Lietz Universal Projector. At the time that the message was coming through an Admiralty message was also tapped. For working the syphon recorder three of the relays designed by Mr. S. G. Brown were used. One of the "A" type instruments was connected to the oscillation transformer. This fed a telephone "G" type relay, to which a telephone was connected, and lastly this was coupled to a "W" type relay. This relay is so adjusted in use that the contact is broken by the very small quick movements of its rocker. The movements are too quick for the syphon recorder to follow, but the duration of each group, however, is recorded. Among the other detectors may be mentioned the sensitive manometric flame, which is influenced by feeble sounds from the receiving telephone, or the gas issuing from a very fine jet may be passed through a piece of wire gauze and lighted. This flame is more rapid in action and therefore more dead-beat. The most sensitive spot for the telephone is at the mouth of the orifice from which the jet issues. These instruments may be tuned to discriminate between sounds of different acoustic pitch. Besides the Brown relays, the Hurltley relay may be used. In this a moving coil moves a very fine straight wire of considerable resistance, which is slightly heated by passing a current through it, in and out of a blast of cold air proceeding out of a narrow slot. The alterations in resistance due to the temperature changes are sufficient to work a telegraphic instrument. In the Orling relay a suspended coil has a finger which just touches on one side of a minute jet of acidulated water. When the coil moves the jet is moved to a much greater extent, and is arranged to bridge or leave open the space between two contacts in a local circuit. It was announced during the Address that Sir William Crookes and Sir Oliver Lodge had consented to become Honorary Members of the Society.

It is remarkable how long the hand-replacement "drop" indicator has survived, in spite of the numerous improvements in telephone switchboards during the past twenty

years. When central battery switchboards with lamp visuals were introduced, a great point was rightly made of the fact that the calling indicator and answering jack were brought together so that one thought and one action only was needed on the part of the operator. For small magneto boards, in which it was not expedient to have lamp visuals, a combined jack and indicator immediately suggested itself, and about nine or ten years ago, we believe, Messrs Ericsson designed one. It was not extensively adopted, however, at any rate not in this country, and it is interesting to see that the idea has been revived by the Peel Conner Telephone Works, who are supplying magneto switchboards for from twenty to 150 lines, with combined jacks and indicators. The boards also have clearing indicators which are mechanically replaced by the operation of the listening key.

We have received from Siemens Bros. & Co., Ltd., a copy of their revised pamphlet dealing with quenched spark wireless installations for ships. The pamphlet was first issued in May last, and was reviewed in *ELECTRICAL ENGINEERING*, June 5th, 1913, p. 325, Vol. IX. The following shipping companies are amongst those who have adopted this system:—The Federal Steam Navigation Co.; Alfred Holt & Co.; the Indra Line; the General Steam Navigation Co.; the Australind Steam Shipping Co.; P. Henderson & Co.; and the Dover Harbour Board. There are now, we are informed, over ninety British vessels so fitted. It is not necessary to provide a specially made sound-insulated cabinet to contain the spark gap, as the working is practically noiseless. The energy radiated by the aerial is in the form of practically an undamped wave, and as the note is musical, it can be heard over natural electric discharges or "atmospherics," even when these are as much as ten to fifteen times as intense as the incoming signals. The larger stations are supplied in two types, called the "tropical" and "standard" forms. The essential difference between them is that in the tropical type a Leyden jar form of condenser is used, whilst in the standard type an oil condenser is used. Both installations have the same range, but the former is built mainly of metal, so that it does not suffer so much by constant exposure in a tropical climate. The smallest station dealt with is intended for use on launches, and requires only 300 watts, and has a range from eighteen up to thirty miles. The dimensions of the set are 1 ft. 8 in. by 2 ft. 6 in. All the apparatus is mounted upon a board. The largest station which is described has a guaranteed range of up to 550 miles, which is, however, considerably larger than the stations usually installed in mercantile vessels, although the *Imperator* is fitted with a 7.5-kw. quenched spark installation. We understand that the Company have in hand at Woolwich the construction of three naval stations having a guaranteed range from 800 to 2,000 miles. The pamphlet is profusely illustrated, and contains also a large amount of purely descriptive matter. All those interested in wireless telegraphy should apply for a copy.

An interim dividend of 10 per cent. on the ordinary shares is announced by Marconi's Wireless Telegraph Co.

An article by Mr. Charles Bright in the January number of the *Quarterly Review* discusses the question of inter-imperial telegraphy and the advantages and disadvantages of cable telegraphy as opposed to wireless telegraphy. Whilst in favour of the State taking over control of the Imperial Telegraph Wireless Scheme, Mr. Bright thinks that an inter-imperial telegraph system would be the more advantageous. The route suggested is from Blacksod Bay, on the West Coast of Ireland, to Halifax (N.S.), with an intermediate station at Cape Bauld (Newfoundland), and a branch cable up the Gulf of St. Lawrence towards Montreal. The cost of this line is estimated to be £500,000, and should be borne by the Empire as a whole. Having laid the Imperial Atlantic Cable, it is suggested that the gaps should be filled up in order to complete an all-British cable chain between the mother country and her outlying possessions. Attention is drawn to the fact that all the existing Atlantic cables are in foreign hands, and it is recommended that steps should be taken to remedy this state of affairs, which, it is argued, would be extremely prejudicial to the British nation in the event of international disputes.

Communication between Bailundo and Bihé in Angola was down on the 20th inst. and restored on the 21st inst.—The Curcavellos St. Michael and Fayal St. Michael cables are broken, and although telegrams up to the 22nd inst. were sent by mail opportunities, since that date messages are being sent via the Porthcurno-Fayal cable without change of rates.—The Oran-Tangier and Tangier-Cadiz cables failed on the 21st inst., and the Fao route was down on the 23rd between Alep and Bagdad, and Moussoul and Bagdad, and was repaired on the 24th inst.



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"Hazzell's Annual for 1914." Edited by T. A. Ingram. 592 pp. 7½ in. by 5 in. (London: Hazzell, Watson & Viney, Ltd.) 3s. 6d. net; abroad, 4s. 1d.

"The 'Practical Engineer' Electrical Pocket-Book and Diary" for 1914. 584 pp. 5½ in. by 3½ in. 169 figures. (London: Technical Publishing Co., Ltd.) Cloth, 1s. net; by post, 1s. 2½d. Peltine, 1s. 6d. net; by post, 1s. 8½d.

"Electrical Engineering," by C. V. Christie. 417 pp. 9½ in. by 6½ in. 378 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 17s. net.

"Elementary Graphic Statics," by J. T. Wight. 227 pp. 7½ in. by 5 in. 135 figures. (London: Whittaker & Co.) 4s. net; abroad, 4s. 4d.

"Village Electrical Installations," by W. T. Wardale. 80 pp. 7½ in. by 5 in. 12 figures. (London: Whittaker & Co.) 2s. net; by post, 2s. 2d.

"Transmission Line Formulas for Electrical Engineers and Engineering Students," by H. B. Dwight. 137 pp. 8 in. by 5½ in. 27 figures. 17 tables. (London: Constable & Co., Ltd.) 8s. 6d. net; abroad, 8s. 10d.

"Soft Soldering, Hard Soldering and Brazing," by J. F. Hobart. 190 pp. 7½ in. by 4½ in. 62 figures. (London: Constable & Co., Ltd.) 4s. net; abroad, 4s. 3d.

"T.S.F. La Télégraphie sans Fil. La Téléphonie sans Fil. Applications Diverses," by G. E. Petit and L. Bouthillon. 243 pp. 10 in. by 6½ in. 185 figures. (Paris: Librairie Ch. Delagrave.) 7s. 6d. net; by post, 7s. 11d.

"The Inventor's Adviser and Manufacturer's Handbook to Patents, Designs and Trade Marks," by R. Haddan. 468 pp. 8½ in. by 5½ in. (London: Harrison & Sons.) Ninth edition. 5s.; abroad, 5s. 5d.

"The Practical Electrician's Pocket Book for 1914." Edited by H. T. Crewe. 498 pp. 5½ in. by 3½ in. 296 figures. (London: S. Rentell & Co., Ltd.) Cloth, 1s; by post, 1s. 3d.; Rexine, 1s. 6d.; by post, 1s. 9d.

"Spon's Architects' and Builders' Pocket Price Book, 1914." Edited by C. Young and S. M. Brooks. 308 pp. 6½ in. by 3½ in. (London: E. & F. N. Spon, Ltd.) 41st edition. 2s. 6d. net; by post, 2s. 8d.

### REVIEWS OF BOOKS

**Insulation and Design of Electrical Windings.** By A. P. M. Fleming and R. Johnson. 224 pp., 9 in. by 5½ in. 102 figures. (London: Longmans, Green & Co.) 7s. 6d. net; abroad, 8s. 1d.

We heartily recommend this most excellent book to our readers. While much of the experimental and research work it contains has already been published by the authors in another form, there is a great deal of new matter, and a text-book has been produced of a most comprehensive, thorough, and practical character. The volume affords most interesting reading throughout, and will appeal equally to the operating engineer and to the designer and manufacturer. After an introduction to the physical characteristics of dielectrics in general, the authors discuss the values of the actual electrostatic stresses to which different kinds of windings may be subjected during operation, both normal and abnormal. This is followed by a thorough chapter on insulating materials, containing some useful notes on transformer oils. The design of windings is then discussed with special reference to insulation problems. The chapter on insulation tests is obviously the fruit of considerable experience on the part of the authors, who rightly call attention to the uselessness of the insulation resistance tests sometimes specified. The prolonged drying-out given to a machine in order

to reach a high insulation resistance may do more harm than good. The authors also depreciate extra-high pressure tests on account of the excessive strain on the dielectric, and of the possibility of the breakdown in composite insulation of the layers of materials of lower specific inductive capacity, due to a non-uniform potential gradient. Their fear of danger of chemical action during these short high-pressure tests is surely unfounded, however. A useful chapter on the drying and handling of windings follows, and in conclusion the authors add a few notes on insulation failures of a highly practical and valuable nature. One warning against welded laminations at points of breakdown in slots (producing overheating by eddy-currents and burning of the new coils) would have saved a second breakdown in the case of a 5,000 kw. alternator within the reviewer's own knowledge recently, had it been kept in mind.

**Transmission Line Formulas for Electrical Engineers and Engineering Students.** By H. B. Dwight. 137 pp. 8 in. by 5½ in. 27 figures. 17 tables. (London: Constable & Co., Ltd.) 8s. 6d. net; abroad, 8s. 10d.

One striking feature of electrical work is the accuracy with which results can be predetermined, and this handy little book on transmission line calculations is an excellent example. The effects of inductance, capacity and resistance on the line drop and regulation are here reduced to a few simple formulæ, the derivation of which can be easily followed. For transmission lines up to 100 miles in length with a regulation of less than 10 per cent., the author provides a chart from which the regulation under different conditions of load and power-factor can be read off almost directly, and with an accuracy within 0.5 per cent. of the line pressure. Very simple formulæ neglecting the inappreciable capacity effects are given for lines up to twenty miles in length. A second series of formulæ include the effects of capacity, but neglect the leakage and corona loss. For very high voltage lines, for which this last effect must be taken into account, a third set of formulæ must be used. A large number of examples are worked out, one of the most interesting being the predetermination of the power factor which would be necessary at the receiving end of a 110,000-volt transmission line to cause the pressure at that end to be the same as the pressure at the generator end. The more difficult and complex hyperbolic formulæ are given, but the author also presents an easier method of obtaining the same degree of accuracy as is reached with hyperbolic formulæ, consisting of the use of formulæ expressed as converging series. Any desired degree of accuracy can be obtained with these series. There are some useful chapters on the reactance of single wires and stranded cables, and on the skin effect, and finally a number of tables giving the values of reactance, &c., used in the formulæ. It is unfortunate that these values are scheduled for B. and S. gauge wire, and for area in circular mils. only. The diameter in inches is given, but the addition of the area in square inches would have made reference easier for British readers.

**Alternating Currents and Alternating Current Machinery.** By D. C. Jackson and J. P. Jackson. 968 pp. 9 in. by 5½ in. 526 figures. (New York: The Macmillan Co.; London: Macmillan & Co., Ltd.) New edition. 23s. net; abroad, 24s. 1d.

The first edition of this work appeared in 1896, at a time when text-books on alternating currents were not plentiful, and at once took a high place in the literature of the subject. Naturally, the enormous developments in the study and in the use of alternating currents have necessitated almost its entire re-writing, and this has been done by the authors without losing any of the clearness of their earlier work. The mathematics—and the book is one in which mathematical treatment forms a large but by no means exclusive part—is carried further than was possible before, especially in respect to vectors, complex quantities, and Fourier's series. The authors, however, use mathematics only as a means to their

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**Telephone Cables.** A Handbook of the Design, Construction and Maintenance of the Telephone Cable Plant. By J. C. SLIPPY. 147 pp. 7 in. by 4½ in. 97 figures. (Pittsburg: J. C. Slippy.) 10s. 6d. net.

This small volume does not deal with the manufacture of cables at all, but constitutes a useful epitome of American practice with regard to the specification and lay-out of the cable part of the telephone network. Overhead work receives the best treatment, and the greater part of the book is allotted to this subject. Telephone engineers and linesmen will find in it much that is of practical use to them.

**Electric Lighting Accounts.** By G. JOHNSON. 171 pp. 8½ in. by 5½ in. (London: Gee & Co., Ltd.) Second edition. 7s. 6d. net; abroad, 7s. 11d. (Accountants' Library, Vol. XXIX.)

An elaborate system of book-keeping, suitable for a large electricity supply company, is set forth in detail, and such matters as the purchase, storage, and record of stores and materials, and the statements prepared for the monthly meetings of directors are included. We are unable to say whether the system described is in use in its entirety by any particular company, but in any case there is much in the volume that may give useful suggestions to those managing electricity supply undertakings. The value of the book would have been enhanced if indications were given as to the means by which the system could be best simplified for smaller concerns, for simplification in some respects would be desirable. At the commencement of the book the accountant has explained to him the methods of charging, and is given copious examples. The reason for and application of the maximum demand system, and the standing charge plus price per unit methods, are explained, but the "rateable value" method is not reviewed. In this section the author has chosen a rather unfortunate example with which to illustrate the maximum demand system; with the particular standing charges and running costs which he has taken, and his prices of 8d. and 2d. per unit, the profit per unit on the short-hour consumer works out to more than on the long-hour consumer for the same number of units, although in his comment the author points out that the small consumer who makes a steady demand over a longer period daily is a more profitable customer to the lighting company, though his total consumption for the same period is much less. "Diversity factor" is somewhat unnecessarily dragged in on a later page, as the author does not explain how it may affect the construction of the light and power tariff, and, moreover, the definition of it quoted is a hundred times the reciprocal of that generally accepted. Taking into account the large number of specimen rulings, the price of the book is very moderate.

**Electricity in the Service of Man. Vol. II. Section 1. Technology of Electricity.** By R. M. Walmesley. 686 pp. 9½ in. by 6½ in. 691 figures. 11 plates. (London: Cassell & Co., Ltd.) 7s. 6d. net; abroad, 8s. 6d.

It is a little difficult to appreciate exactly for what class of readers this book is really intended. On the one hand the treatment is too complex to enable it to be designated "popular," and yet it is neither elementary nor advanced, though it gives a good general idea of the construction of machines, their accessories and generating stations. There are large numbers of sketches, scale drawings, and photographs of both complete machines and details, which for certain purposes render it useful for students. Vol. I., which appeared in 1910, dealt with the "History and Principles of Electrical Science," and Vol. II. deals with the "Technology of Electricity." The part of Vol. II. which has just





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appeared is designated, "The Generation, Transmission, and Utilisation of Electrical Power"; however, only continuous and alternating-current generators, generating stations, and continuous-current motors are dealt with. Presumably the remainder of the subject, including transmission, alternating-current motors, traction, electro-chemistry, and electro-metallurgy are to be dealt with in the second part. Telephony, telegraphy, and signalling generally are also to be dealt with later. So far as Vol. II., Part I., is concerned, it deals with the subjects treated of at length, and especially near the beginning reference is continually made retrospectively to Vol. I., or further forward in its own pages. Although the bulk of the space is devoted to machinery, yet switchgear, voltage regulators, synchroscopes, &c., are ably treated and form one of the most interesting parts of the book. The chapter on generating stations, deals with steam, gas, oil, and water-driven stations, and numerous examples of new and old plant are given. It is to be regretted that each part does not have its own index.

**Formulae and Tables for the Calculation of Alternating-Current Problems.** By L. COHEN. 282 pp. 9½ in. by 6½ in. 68 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.

There are many electrical engineers who have often wished for a handy collection of the most useful mathematical formulae necessary to solve A.C. problems. In this book there is such a collection of formulae with their derivations, suitable explanations and examples of use. The problems dealt with include those involving resistance and eddy current losses in metallic conductors, inductance, capacity, and many of the combinations of these found in practice and constituting an A.C. circuit. Besides the formulae relating to the conditions prevailing when a steady state is reached, transient phenomena are also dealt with. This treatment, of course, involves the use of the higher mathematics, including hyperbolic functions. The book is made complete by the inclusion of a valuable chapter on mathematical formulae, and it will prove a desirable addition to the libraries of those who have to do with power, telephony and telegraphy over wires and through the ether, as well as of those who are studying the general subject of alternating currents.

**Transformer Practice.** By W. T. TAYLOR. 278 pp. 9½ in. by 6½ in. 191 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 2nd edition, 10s. 6d. net.

There is included in this book a considerable amount of useful information concerning the connection, installation, and working of transformers, but the author has, in his endeavour, no doubt, to make it as complete as possible, included examples of transformer connections, rarely, if ever, met with in practice. If an engineer in charge of transforming plant was not prepared to carry out emergency connections in cases of possible trouble, some considerable time would probably elapse before a parallel case was found described in this work. On the other hand, the style of the section dealing with transformer connections renders it more suitable for reference than for continuous reading. The author indulges in some peculiar calculations at times, though correct results are obtained. There are indications, too, that the proofs have been passed in a rather hurried way. There is an interesting discussion on the cheapest and best way of connecting three-phase systems, both earthed and unearthed. The chapters on transformer cooling and transformer construction are instructive, as are also those devoted to constant current and series transformers, and variable ratio transformers. Protection and testing are also well treated. It must also be said that, in general, the diagrams are arranged so as to be self-explanatory, and to convey rapidly to the mind what the author intends them to.

**Village Electrical Installations.** By W. T. WARDLE. 80 pp. 7½ in. by 5 in. 12 figures. (London: Whittaker & Co.) 2s. net; by post, 2s. 2d.

This is a subject upon which little specific has been written, and yet one which has certainly deserved a book to itself; and the author has supplied it. He clearly indicates which applications of present-day practice are most applicable to village lighting, and gives examples and illustrations of actual plants already serving this purpose in Great Britain. There is no doubt that a large field exists for an extension of electric lighting in small places outside the range of power companies' operations. While there have been for years hundreds of villages on the Continent and in the United States provided with electric light, there are com-

paratively few in this country. The small Continental installations are mostly run by water power, which, as is popularly but erroneously supposed, "costs nothing." But if a comparison were made of the capital cost of some of the earlier of these stations, erected in the 4-watts-per-candle days, and the cost of a steam, gas, or oil station of one-third the capacity—for supplying the same number of tungsten lamps—it would be found that the saving in the interest and reasonable depreciation and sinking fund charges would be far greater than the fuel costs.

#### Handbook of Technical Instruction for Wireless Telegraphists.

By J. C. Hawkhead. 295 pp. 8½ in. by 5½ in. 170 figures. (London: Marconi Press Agency, Ltd.) 3s. 6d.; abroad, 8s. 11d.

It is even more important that wireless telegraphists on sea-going vessels should have a clear understanding of the apparatus under their control than it is for wireless telegraphists in land stations, though obviously it is desirable that all persons in charge of apparatus should understand its working. It is often the case, however, that wireless operators accustomed to land working do not know sufficient to enable them to take up marine wireless without additional training. This handbook is calculated to appeal to this large and rapidly growing class, as well as to amateurs, as the information contained is of a reliable nature, and is imparted in an interesting manner by one who writes from practical experience. There are three parts to the book. The first deals with the fundamental properties of electricity and electric circuits; the second deals with electro-magnetic waves and receiving circuits; and the third deals with aërials, and complete ships' and portable sets, while some space is devoted to faults and testing, and general useful hints for keeping the equipment in good condition. Analogies are resorted to, but are not pressed too far, while there are numerous diagrams and photographs. Nothing of importance for those to whom the book is addressed has been omitted from the text, so that anyone who goes through it carefully should be qualified to sit for the Post Office examination for wireless telegraphists.

**Automatic Telephony.** By S. Turner. 32 pp. 7½ in. by 4½ in. 13 figures. (London: S. Rentell & Co., Ltd.) 6d. net; by post, 7d.

This cheap book on the subject, written by a member of the Engineer-in-Chief's staff at the Post Office, will doubtless be popular, but its utility is to some extent impaired by the bad printing of two of the most important illustrations. A not unusual printers' error of "multiplied," instead of multiplied, has escaped the author's attention when reading the proofs.

**Jahrbuch der Elektrotechnik für 1912.** By K. Strecker. 223 pp. 9½ in. by 6½ in. 16 figures. (Munich: R. Oldenbourg.) 8s. net; by post, 8s. 8d.

This book, which it is proposed to publish annually every spring, is taking the place of the *Fortschritte der Elektrotechnik*. The latter has appeared regularly for many years, and presented, in a classified form, references to all the papers, articles, patents, &c., which had appeared in the Press and Institution proceedings in Europe and America during the previous year. This was by no means as useful as, though perhaps more comprehensive than, our own *Science Abstracts*, and the present volume is less useful still, as the references are bare volume and page references, and the reading-matter a curt summary of progress without details. The former and more useful arrangement was given up owing to the high cost of production.

**Electric Lighting: A Practical Guide to the Wiring of Houses and the Installing of Electric Light Plants.** By A. H. Avery. 150 pp. 7½ in. by 5 in. 65 figures. (London: Cassell & Co., Ltd.) 2s. net; by post, 2s. 3d.

Amateurs must be supplied with books. Electricity has a fascination for the amateur, and he will not stop at bell-wiring and the making of model dynamos and motors, but is bound sooner or later to try his hand at electric lighting. He must derive his knowledge largely from newspapers and books dedicated to his class, and there are many to supply his needs. Unfortunately, the large majority of these are written by men who are themselves amateurs, and in consequence mistakes in them are not uncommon, and the directions given are not always in conformity with the best practice. Assuming, therefore, as we must, that the amateur will have his books, it is preferable that they should be written, as is this one, by an electrical engineer. The author has a clear grasp of the class of matter which the amateur requires, and there is little in his book to which exception can be taken.

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**Soft Soldering, Hard Soldering, and Brazing.** By J. F. Hobart. 190 pp. 7½ in. by 4½ in. 62 figures. (London: Constable & Co., Ltd.) 4s. net; abroad, 4s. 3d.

This book is wholly American in tone and expression. To the English reader it appears in parts very loosely written, and scrappy as to its matter, and is apparently largely composed of receipts for the various operations detailed, reprinted from some monthly journal (quoted in the text), to which they had been previously contributed. Its chemistry is hazy, and is in need of urgent revision. It is essentially a book for the amateur and the apprentice in the sheet metal trades. These could certainly read it with profit, whilst those of more mature experience may gain a few hints from its contents. In a simple way it describes the why and wherefore of many of the known processes of soft and hard soldering, and thus conveys some useful information to the beginner.

**Elementary Graphic Statics.** By J. T. Wight. 227 pp. 7½ in. by 5 in. 135 figures. (London: Whittaker & Co.) 4s. net; abroad 4s. 4d.

THE author's endeavour has been to present a book suitable for students in search of a working knowledge of the application of graphical methods to the solution of the simpler problems met with in the practice of engineering and its ally, building construction. The use of graphical methods of solving certain problems is one which is appreciated by a far larger number of engineers than is the equivalent analytical methods, and is, in fact, largely used in practice. The book under review opens with the definition and specification of a force, and its graphic representation, and leads up to the design of roofs, braced beams, retaining walls, &c., and shows how to take into account different kinds of known and unknown loads. It is of useful size, and the matter is well put together and illustrated.

**The Inventor's Adviser and Manufacturer's Handbook to Patents, Designs, and Trade Marks.** By R. Haddan. 468 pp. 8½ in. by 5½ in. (London: Harrison and Sons.) Ninth edition. 5s.; abroad, 5s. 5d.

This is a real "Adviser" upon all matters pertaining to patents, designs, and trade marks. Not only does it give a useful and complete summary of the patent laws of all countries, but a most helpful discussion is given of the nature and policy of patents, and the pitfalls to be avoided when taking out patents, &c. By the aid of this handbook, nobody need be at a loss to understand how to go to work to protect an invention, nor be in doubt as to the nature of such protection when it is obtained. The many new questions of patent law involved by the passing of the Patent Act of 1907 are dealt with, and the authorities are quoted for the various decisions referred to.

**Naval Warfare.** By J. R. Thursfield. With an Introduction by Rear-Admiral Sir C. L. Ottley. 151 pp. 6½ in. by 5 in. (Cambridge: The University Press.) 1s. net; by post, 1s. 2nd. (Cambridge Manual.)

We have in this volume another addition to the excellent series of "Cambridge Manuals of Science and Literature," which are useful to give the general reader a sense of proportion in subjects which are foreign to his specialised study. The author lays down the general principles of naval warfare, amply illustrates them from history, and without going much into technicalities clears one's ideas on the subject. He gives due credit to wireless telegraphy as assisting communication, but is inclined to think that the strengthening of supreme control which it brings may weaken the initiative of individual commanders. Otherwise there is little relating to the part, nowadays no inconsiderable one, played by electrical engineering in naval warfare.

**The Practical Electrician's Pocket Book for 1914.** Edited by H. T. Crewe. (London: S. Rentell & Co., Ltd.) Cloth, 1s.; by post, 1s. 3d. Rexine, 1s. 6d.; by post, 1s. 9d.

In making its sixteenth annual appearance, this handy little pocket book now reaches nearly 500 pages, and bears evidences of extensive revision by its editor, Mr. H. T. Crewe, and his associates, to keep pace with the rapid developments of electrical engineering. A new chapter has been added by Mr. R. J. Wallis Jones on electric welding, and the all-important subject of electric cooking has been placed in the able hands of Mr. F. S. Grogan, who is known all over the country in connection with the application of electricity to the culinary art. Other sections to which additions have been made include those dealing with automatically controlled country-house lighting plants, the use of which is rapidly extending, electro-plating, electric cranes and lifts and electric signs. The whole work is of a practical nature, and is illustrated with particulars of up-to-date commercial apparatus.

**The "Practical Engineer" Electrical Pocket-Book and Diary for 1914.** 584 pp. 5½ in. by 3½ in. 169 figures. (London: Technical Publishing Co., Ltd.) Cloth, 1s. net; by post 1s. 2½d. Peltine, 1s. 6d. net; by post 1s. 8½d.

The growing space required for purely electrical matters has

rendered it necessary in the revision of this pocket-book for the 1914 issue to relegate matters relating to steam to a companion pocket-book on mechanical engineering. The principal additions relate to rectifiers and electric valves, and the care of and the detection of faults in dynamos and motors. The section on Acts of Parliament and official rules and regulations has been extended, and a useful new feature is a short bibliography at the end of each section. Several other sections have been considerably revised.

**Spon's Architects' and Builders' Pocket Price Book, 1914.** Edited by C. Young and S. M. Brooks. 308 pp. 6½ in. by 3½ in. (London: E. & F. N. Spon, Ltd.) Forty-first edition. 2s. 6d. net; by post, 2s. 8d.

This well-known pocket book has been so thoroughly brought up-to-date for this year's edition that the diary pages which were included in former issues have had to be omitted to keep the dimensions of the volume within reasonable limits. A section is devoted to electrical installation work, from which approximate figures can readily be obtained for the cost of electrical lighting or bell installations. Both this and other sections have been revised and extended.

**Hazell's Annual for 1914.** Edited by T. A. Ingram. 592 pp., 7½ in. by 5 in. (London: Hazell, Watson, and Viney, Ltd.) 3s. 6d. net; abroad, 4s. 1d.

Hazell's Annual for 1914 has been brought thoroughly up to date in all the items of information that it contains, and forms a valuable complete and useful compendium of miscellaneous facts and statistics in an easily accessible form. About six pages are devoted to electrical matters, including a general sketch of the present state and recent developments of electricity supply, with notes on electric working, the Edison battery cable and wireless telegraphy, &c. There is one little omission that we must point out, and that is the name of the President of the Institution of Electrical Engineers in the list of scientific and literary institutions. Of the non-electrical contents the short account of the Balkan wars is a most interesting piece of contemporary history.

**Rugby Engineering Society.**—Volume X. of the Proceedings of the Rugby Engineering Society contains among its many interesting items a report of the meeting at which the Paper by Mr. J. P. Chittenden on "Large Turbo Units" was read and discussed, as well as the Papers on "High-speed Bearings," by Mr. John C. K. Balfry, and "Modern High-speed Gearing," by Mr. H. Hubert Thorne. The volume may be purchased from the Society for 10s. 6d.

**New Books.**—Crosby, Lockwood & Son (7 Stationers' Hall Court, E.C.) have just issued the fifth edition of Mr. Erskine-Murray's well-known book, "A Handbook of Wireless Telegraphy." This edition is revised throughout and considerably enlarged. The same publishers will be issuing next month a book by Mr. J. H. Havelock, entitled "Electric Wiremen's Work." This is a text-book in three sections written for installation inspectors, electricians, wiremen, students, and others engaged in the electrical trades.

**L'Annuaire de l'Electricité.**—The first issue of a useful annual volume of reference, published by our French contemporary *La Lumière Electrique*, has just made its appearance. The 440-page book commences with a section on the distribution of electrical energy for power and lighting in France, with full tables of particulars of all the undertakings in the country. A list of traction undertakings is also given, and another section gives particulars of electrical companies of various kinds, including those engaged in manufacturing, distribution, exploitation, and traction. Information is also given of various official bodies, institutions, and societies connected with electrical engineering in France, and further sections of the volume deal respectively with legal enactments relating to electricity promulgated in 1912-13, technical education, and periodical electrical literature. A final list of advertisers forms a useful directory of French electrical firms.

**Proceedings of the National Electric Light Association of America.**—The papers, reports, and discussions at the thirty-sixth convention of the National Electric Light Association last June in Chicago have been published in four volumes. The first of these deals with the proceedings of the general, executive, and public policy sessions, while more technical matters are reserved for the second volume, which includes reports of the special hydroelectric and transmission sessions, before which a number of interesting points connected with high-tension working were discussed, and the more general technical sessions, where the subjects discussed included meters, incandescent lamps and lighting standards of power, prime movers, transforming, converting, and protective plant, overhead line construction, switchboard instruments, arc lamps, and a number of other matters. The third volume, entitled "Commercial Sessions," contains *inter alia* a good deal about applications of electric power, and the last volume is devoted to matters connected with accounting. The volumes form a valuable compendium of current American practice and opinion, and reflect the work of an extremely vigorous association.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Jan. 22nd, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in *italics* indicate communicators of inventions from abroad.

22,036/12. **Alarms for Wireless Receiving Stations.** W. H. SHEPARD and A. E. McKECHNIE. The arrangement comprises a movable switch which is influenced by ordinary calls, as distinct from a special prearranged "dash" call. When the receiving circuit has been operative for a predetermined time, the switch opens or closes the alarm circuit. Eight figures.

24,563/12. **Spark Plug.** W. M. MORDEY. An A.C. or D.C. spark is splayed out or caused to move from its initial position by electro-magnetic action. The spark takes place between the poles of a magnet. The gap is not uniform, and the spark is started in the narrowest part. The metal of the plug may be used as part of the magnet. Three figures.

29,839/12. **"Villard" Vacuum Valves.** W. J. MELLERSH. JACKSON (*E. W. Caldwell, U.S.A.*). The cathode is arranged to cause sufficient concentration of the cathode stream under abnormal regulating conditions to introduce or generate gas in the tube and to restore it automatically to its normal condition. A large surface cathode, a small focussing member, and a loosely movable spherical mirror concentrate the heat of the cathode to effect the regulation. Three figures.

80/13. **Watertight Connection between Lamp and Holder.** S. W. MARTYN. A sleeve fits over the joint which the ordinary lamp-holder makes with the lamp cap, and a screw or spring-ring is used so that there is a pressure tending to force the holder from the cap. Rubber or leather washers are used for making the ends of the sleeve watertight. Two figures.

331/13. **Welding Aluminium.** G. GRÜCHTEL. Between the place of welding and the electrodes are interposed metallic layers, which are removed when the weld is complete or if rendered useless by burning. Eight figures.

6,891/13. **Starting Synchronous Motors.** E. ROSENBERG. A small self-starting synchronous starting motor is mounted on the same shaft as the main motor. The starting motor has defined poles. The rotor is mechanically displaced with regard to the main motor, so that the phase of this may be fixed with respect to the phase of the supply circuit. For starting a rotary converter, the starting motor has an exciting winding connected to the brushes of the rotary in order to control the polarity. Two figures.

7,059/13. **Metal Filament Lamps.** H. ZSCHOCKE. The ends of the sections of metal filaments which are so mounted are fixed in metal clips or are held in grooves on non-conducting supporting arms, so that if during manufacture the filament is broken the whole need not be discarded. Two figures.

8,675/13. **Insulators for High Pressure.** B.T.-H. Co. (*G.E. Co., U.S.A.*). Vacuum chambers are formed in the insulator, and are evacuated to such a degree that no discharge can pass across. Four figures.

18,819/13. **Trolley Omnibuses.** E. CROSS. For running on tramway systems the current collecting and steering gear comprises a pivoted spring-controlled socket connected to the stud axles of the steering wheel, a detachable arm, and a runner or shoe engaging both the groove and table, or flat portion of the rail. A retaining trigger for keeping the shoe off the ground is provided. Seven figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** SCHMIDT [Projector lamps] 5,199/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** LANCASHIRE DYNAMO & MOTOR Co., WOOD and McLEOD [Planing machine drive and control] 43/13; BROTHERTON [Holding insulated coils during installation work] 4,225/13.

**Dynamos:** CHURCHWARD [Combined with governors] 7,146/13.

**Electrochemistry:** GES. FÜR ELEKTRO-OSMOSE [Osmosis] 26,061/13.

**Heating and Cooking:** BASTIAN [Elements] 8,144/12; BLOXAM (*Bergmann A.-G.*) [Heating current of air] 11,874/13.

**Ignition:** DUFFY [Spark plugs] 1,281/13; MELLERSH-JACKSON (*Stringham & Elmendorf*) 6,176/13; LUCAS and TURNER [Automobile engine-starting and lighting] 13,980/13.

**Incandescent Lamps:** GLADITZ [Manufacture of tungsten] 27,859/12; STREMMIG [Production of filaments from viscose] 11,104/13; READ [Filaments] 13,695/13; [Lamps] 16,770/13.

**Instruments and Meters:** PAUL [Magnetometers] 465/13.

**Switchgear, Fuses and Fittings:** JOHNSON (*W. C. Heraeus Ges.*) [Starting switches for mercury vapour lamps, motors, &c.]

27,956/12; VON KRAMER and KAPP [Resonating relays] 444/13; TOWNSON [Earthing clip] 1,862/13; CLEMPSON and MURRELL [Contact-makers] 2,361/13; FULLER [Increasing effect of current variations] 3,539/13; JOHNSTONE and FERGUSON [Regulators for dynamos] 5,158/13; B. T.-H. Co. (*G. E. Co., U.S.A.*) [Switching in high frequency circuits] 7,151/13; ETCHells, CONGDON & MUIR and MUIR [Control gear for lifts] 10,514/13; TOWLER [Controlling gear for electro-hydraulic pumps] 16,807/13.

**Telephony and Telegraphy:** SCHANZENBACH and KNAPP [Extensible mast] 514/13; SIGNAL GES [Wireless transmission system for aeroplanes] 736/13; WITHERS (*Cox and Dicketts*) [Motors for telegraph transmitters] 790/13; [Automatic telegraph transmitters] 791/13; WESTERN ELEC. Co. (*Wohler*) [Automatic telephone exchange] 1,223/13; SIEMENS BROS. (*Siemens & Halske*) 17,124/13; SIEMENS & HALSKE [Semi-automatic telephone circuits] 24,459/13.

**Traction:** LLOYD and NEW TRANSPORT Co. [Distribution of parcels, bales, &c.] 484/13; SOC. ANON. WESTINGHOUSE [Railway signalling] 22,029/13; COOPER [Railway signalling and control] 22,829/13.

**Miscellaneous:** JENSEN (*Dodd*) [Torpedoes] 27,981/12; GRAHAM [Electro-magnetic sound reproducing diaphragms] 1,278/13; GARDNER [Gyroscopes] 2,120/13; FRASER [Lifts] 13,447/13; HARLÉ ET CIE [Submarine mines] 13,807/13; FAERBER [Safety lamps] 16,058/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Electrometallurgy and Electrochemistry:** McNITT [Sodium and other metals] 29,987/13.

**Heating and Cooking:** SIEMENS-SCHUCKERT [Cookers] 29,714/13.

**Ignition:** POGNON [Spark plugs] 28,267/13; BENDIX [Starters for internal combustion engines] 29,814/13;

**Storage Batteries:** SVENSKA AKKUMULATOR AKTIEBOLAGET JUNGNER, 30,082/13.

**Telegraphy:** WIDEGREN [Writing telegraphs. The line capacity effect is reduced by the use of pulsations obtained from a D.C. source, so that a duplex action is set up] 29,239/13, 29,240/13, 29,241/13 and 29,242/13.

**Traction:** PIEPER [D.C. electric-engines] 29,504/13; [Mixed drive] 29,825/13; SIEMENS-SCHUCKERT [Pulling-off trolley lines] 30,045/13.

**Miscellaneous:** KRÜGER [Detecting icebergs at sea] 11,540/13; BOSCH [Lamps fitted with reflectors] 25,497/13.

### Amendment to Specification

22,664/12. **Dynamic Braking of Motor-driven Reciprocating Machine Tools.** B. T.-H. Co. (*G. E. Co., U.S.A.*). As a result of the extended investigation under Section 8, a statutory reference to specification No. 16,806/12 has been inserted.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

1,863 and 1,864 of January 30th, 1900. **Winding Coils.** W. G. HEYS (*J. Scott, R. Varley and J. S. Anderson, U.S.A.*). A number of coils are wound simultaneously on a common core with a sheet of insulating material between each layer. When the winding is complete the insulation and the core are severed between the adjacent helices to form the individual coils.

2,222 of February 3rd, 1900. **Electrolytic Mercury Meters.** A. WRIGHT and REASON MFG. Co. The anode is higher than the cathode. The mercury deposited at the cathode passes over a ridge into a container. The enclosing vessel is of glass, open only at the top, which is provided with a stopper. The electrodes are contained in a completely sealed glass vessel, with pockets to hold the anode mercury. The leading-in wires pass through this vessel.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, &c.:** E. GIRAUD [Earthing overhead lines in case of breakage] 21,945/06.

**Storage Batteries:** T. A. EDISON [Alkaline: one plate is of zinc, and magnesium is deposited on it during charging] 20,072/01.

**Switches, Fuses and Fittings:** SIEMENS BROS. (*Siemens & Halske*) [Sockets for fuse plugs] 22,107/02; J. C. ETCHells [Solenoid-operated rotary switches] 22,349/07.

**Telephony:** A. T. M. THOMSON [Allotting order wires for a definite time] 21,401/04.

**Traction:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Protecting cables against induction from the rails of A.C. railways] 22,302/07; J. G. V. LANG [Series-parallel control] 20,969/08.

**Miscellaneous:** H. TIRMANN [Machine for connecting wires to casings of blasting fuses] 20,019/01.



## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 71. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**INDUCTION MOTORS.**—A new pamphlet dealing with open type and end hood pedestal type induction motors has just been published by Bruce Peebles & Co., Ltd. (Edinburgh). The pamphlet is divided into two parts. The first embraces open-type machines, and the second a very compact form of motor with self-contained bearings. This type is made in sizes up to about 1,000 kw., and is very suitable for direct coupling to fans, pumps, &c. The tables giving approximate weights, dimensions, rating, and other technical data are very complete. The names of some of the firm's larger customers, and names and addresses of its foreign and colonial agents, is given.

**MAGNETO TELEPHONE SWITCHBOARDS.**—The Peel Conner Telephone Works, Ltd. (Peel Works, Adelphi, Salford), have issued a new Bulletin relating to magneto cell switchboards and accessories. Reference to one of the features of this is made in our Telephony and Telegraphy column. The range of switchboards in question are of the non-multiple type, suitable for small exchanges and private installations.

**RADIATORS.**—A booklet has been published by the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), dealing with "Ediswan" Quartzalite patent heaters and radiators. Reproductions of a number of photographs of domestic installations are given to show that it is not necessary always to put the radiator in the fireplace.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**INSTRUMENTS.**—The first five sections of what will form a complete descriptive catalogue of the many delicate instruments made by R. W. Paul (Newton Avenue Works, New Southgate, N.) are now available. The sections referred to embrace resistances and rheostats, unipivot instruments for D.C. or A.C., D.C. laboratory apparatus, A.C. measurements, and high-frequency measurements. The sections to come will deal with "ohmmeters for measuring insulation and conductivity" and "electrical pyrometers." Each instrument is fully described and its working explained. The price-list for each section is given as a coloured inset, and the first figure of the list number and page number are identical. The initial letter of the code word designates also the section in which the description can be found. Separate price-lists are being printed in foreign currencies. The complete catalogue will contain over 2,000 entries and about 800 illustrations and diagrams.

**POWER TRANSMISSION ACCESSORIES.**—A neat pocket catalogue has just been sent us by Harpers, Ltd. (Aberdeen), who intimate that they will be glad to send a copy on application to any address. The following accessories are among those dealt with:—Wheel gearing, belt pulleys, rope pulleys, steel shafting, and pedestals and fixings.

A conveniently arranged pocket-book and diary, 4½ in. by 3½ in., has been sent us by McClure and Whitfield ("Mersey", Dynamo Works, Adwood, Stockport). The London representatives of this firm are Hogan & Wardrop (2 Gresham Buildings, Basinghall Street, E.C.).

### CORRESPONDENCE

#### CABLE CASINGS.

*To the Editor of ELECTRICAL ENGINEERING.*

DEAR SIR,—On November 27th, 1913, a letter was kindly placed in your paper requesting readers to give us their opinion whether casings would be more satisfactory if the edges were thicker to take a screw with the centre fillet proportionately less than is usual at present.

We have had numerous replies, and the general opinion appears to be in favour of having the three fillets of equal thickness, so that the capping can be screwed on the two edges of the casings, and still leaving the fillet in the centre

of sufficient size with care to put a screw through to screw the casing also on to the ground to which it has to be fixed.

Would any of your readers express further opinions on this point? We, as manufacturers, wish to make this material to suit general requirements, and intend to alter our standard pattern very shortly with the outside edges and the centre of equal size unless many expressions of opinion are to the contrary.

Yours, &c.,  
C. JENNINGS & Co.

Pennywell Road, Bristol.  
January 23rd, 1914.

### "HALF-WATT" LAMP FITTINGS

THE two following illustrations show the ventilated fitting for use with "half-watt" lamps which is being put on the market by Siemens Bros. Dynamo Works, Ltd. (Incandescent Lamp and Fittings Department, Tyssen Street, Dalston, N.E.). It may be seen that the "Goliath" Edison screw holder is fastened to a carrier which is mounted on a slide so as to allow some regulation in the position of the lamp in the globe of the lantern. The latter is provided with

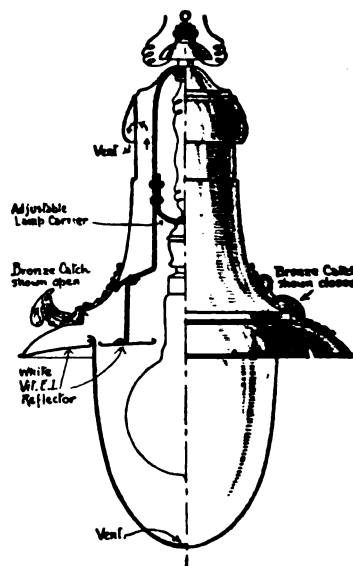
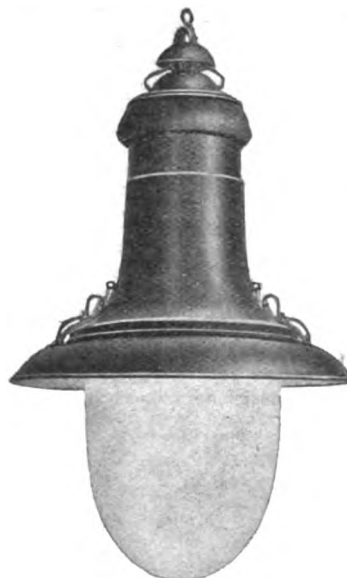


FIG. 1.—GENERAL APPEARANCE OF SIEMENS' "HALF-WATT" LAMP FITTING. FIG. 2.—ARRANGEMENT OF COMPONENT PARTS OF FITTING.

an insulated shackle suspension which renders it suitable for use in all weathers. A wire guard may be used if desired to cover the opalescent globe. It is decided to manufacture the fitting in three sizes. The first is suitable for 600 c.p. and 1,000 c.p. lamps; it is 14½ in. in diameter and 24 in. long. The second is suitable for 1,000-c.p. and 2,000-c.p. lamps; it is 18 in. in diameter and 28 in. long. The third size is suitable for 2,000-c.p. to 3,000-c.p. lamps; it is 22½ in. in diameter and 30 in. long.

**Importation of Metal Filament Lamps into the United States.**—According to Mr. E. J. Deuth, of Deuth and Co., New York, there is a large and growing demand in the United States under the new tariff for first-class metal filament lamps of foreign make, says the *Electrical World*, and the imports of these lamps are increasing rapidly.

**Callender's Hospital and Distress Fund.**—The eleventh annual report of this fund records an income from subscriptions and donations of about £350. Gratuities to members in time of need and for the purchase of spectacles and surgical appliances amounted to £95, and £251 was contributed to various hospitals. 336 hospital letters were issued. It has not been found that the Insurance Act has diminished the activities of the fund. The report was adopted at the annual meeting at the Belvedere Works on January 24th, Mr. A. R. Kibblewhite being in the chair.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Aldershot.**—Cable extensions at an estimated cost of about £200 are to be carried out.

**Belfast.**—Additional plant will shortly be required to meet the increasing demands upon the power station.

**Bristol.**—Twelve months' supply of A.C. meters, arc-lamp carbons, joint boxes, &c. Borough Electrical Engineer. February 12th. (See advertisement on another page.)

**Colchester.**—Twelve months' supply of electrical stores. General Manager and Engineer. February 7th.

**Gravesend.**—A loan of £13,600 is to be applied for in connection with new generating plant.

**Halifax.**—Twelve months' supply of various stores. Borough Electrical Engineer, February 16th.

**Hastings.**—A loan for mains extensions is to be applied for.

**Huddersfield.**—A loan of £30,000 for electrical extensions has been sanctioned by the Local Government Board.

**Liverpool.**—The City Electrical Engineer recommends that the second half of the new extension scheme should now be proceeded with.

**London: Hammersmith.**—Twelve months' supply of cables, meters, &c.—Borough Electrical Engineer. February 4th.

**Newfoundland (N.S.).**—According to a Reuter telegram, the Government has granted a concession for the use of water-power to the extent of 1,000,000 h.p. at the Grand Falls, Labrador, for the generation of electricity to be used in connection with the extraction of nitrogen from the atmosphere.

**Newport.**—Twelve months' supply of various stores. Borough Electrical Engineer. February 14th.

**Pontypriid.**—Twelve months' supply of various stores. Borough Electrical Engineer. February 9th.

**Yorkshire.**—The Yorkshire (West Riding) Electric Tramways Co. is to raise additional capital to meet the growing demands of its tramway and lighting business. A provisional order has been obtained for lighting the town of Pontefract.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Burton-on-Trent.**—New cinematograph theatre.

**Croydon.**—Thirty-six houses, Meadvale Road. A. J. Fraser, Mortimer Road, West Ealing.—Thirty-five houses, Charnwood Road. A. E. Bates, Brighton Road, Purley.—Ninety-one houses, Capri Road. J. Weller, Dalmally Road.—Fourteen houses, Ashburton Avenue. T. G. Crump, 5 Station Road.—Forty-two houses, Shirley Park Road. J. B. Hemmings, Addiscombe Road.

**Felixstowe.**—New theatre. H. R. Cooper, Queen Street, Ipswich.

**Hitchin.**—Additions to Isolation Hospital (£27,500).

**Hyde.**—Electrical installation at the Town Hall extensions. Architect, J. H. Fletcher, 45 Clarendon Place.

**Llandudno.**—Drill hall. Architect, E. Evans, 8 Castle Street, Carnarvon.

**London: L.C.C.**—223 wiring points at Hilly Fields elementary school. (See advertisement on another page.)

Rebuilding of Tivoli Music Hall.

**Newcastle-on-Tyne.**—New Town Hall.

**Port Talbot.**—New hospital. Architect, F. B. Smith.

**Richmond (Surrey).**—Additions to Town Hall.

### Miscellaneous

**Australia.**—The Sydney Harbour Trust requires three electric travelling cranes. Tenders by March 2nd. This information is only of use to those firms having agents in Australia who can be instructed by cable.

**Belfast.**—Twelve months' supply of miscellaneous stores. City Electrical Engineer, February 23rd. (See advertisement on another page.)

**Dover.**—A large expenditure upon tramway track reconstruction has been reported to the Council as necessary.

**Greenock.**—150-ton electric crane for Harbour Trustees. Engineer, February 11th.

**Ireland.**—The Midland Railway Co. of Ireland requires a twelve-months supply of electrical stores. Secretary, York Road Terminus, Belfast.

**Liverpool.**—One hundred 40-h.p. double-motor equipments for the Tramways Department. Tramway Manager, February 12th.

## TENDERS RECEIVED AND ACCEPTED

**Grimsby.**—The tender of Messrs. Berry Skinner & Co. has been accepted for motor-starting apparatus, and that of Messrs. H. Green & Co. for motors.

**Leicester.**—A contract has been placed with Messrs. Siemens Bros. Dynamo Works for a second 3,000-kw. turbo-alternator at the Lero Power Station, similar to the one in course of erection, at £11,352.

Contracts have also been placed with the Brush Electrical Engineering Co. for ten canopy-top tramcar bodies at £3,842, and with Messrs. Dick, Kerr for the electrical equipment and trucks at £3,486.

**Norwich.**—The tender of Messrs. Siemens Bros. Dynamo Works has been accepted for H.T. switchgear at £676.

**Rugby.**—The tender of Messrs. W. T. Henley's Telegraph Works Co. has been accepted for cable at £257.

## APPOINTMENTS AND PERSONAL NOTES

We much regret to announce that, owing to continued ill-health, Mr. Bernard M. Jenkin has decided to retire from his partnership in the firm of Kennedy & Jenkin, Consulting Engineers. The partnership will be continued in future by the remaining partners (Sir Alex. B. W. Kennedy, Mr. J. M. Kennedy, and Mr. S. B. Donkin) under the name of Kennedy & Donkin.

Mr. C. W. Bentley has resigned from the managership of the Musselburg & District Electric Light & Traction Co., and is to be succeeded by Mr. Robert Watson, late Secretary of the Company in London. Mr. D. L. Winter, of the Bo'ness Electric Tramways, Ltd., has been appointed Resident Manager.

The Exeter Lighting Committee recommends that the salary of Mr. H. D. Munro, the Borough Electrical Engineer, be increased to £475. It is also recommended that the maximum salary of the chief clerk in the Electricity Department be advanced from £140 to £160 per annum, and that the following maxima be also fixed, viz., mains foreman from 42s. to 45s. per week, assistant jointer from 30s. to 35s., engine drivers from 34s. to 36s., stokers from 27s. to 30s.

The Singapore Electric Tramways, Ltd., requires an assistant electrical engineer. Applications to Secretary, 19 St. Swithin's Lane, E.C.

A shorthand and typewriting clerk is required by a firm of electrical engineers. (See advertisement on another page.)

A mechanic with electrical engineering knowledge is required. (See an advertisement on another page.)

An engineering and mechanical draughtsman is required in the Stoke-on-Trent Electrical Engineer's Department. (See advertisement on another page.)

**Central Suspension Lighting.**—Referring to the small illustrated paragraph on page 54 of our last issue, the Wardle-Engineering Co., Ltd., call our attention to the fact that the London Electric Firm is not alone in supplying suspended lighting units for use with existing tramway poles, and that the Wardle Company themselves manufacture the Barrow suspension device, which has been in use for a long time, having been patented by Mr. Burnett, of Barrow-in-Furness, in 1910. They send us several illustrations of typical arrangements.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

## A NEW CABLE WORKS

A COMPANY named The Pirelli-General Cable Works, Ltd., has been registered with a capital of £200,000 to carry on the business of "manufacturers of and dealers in india-rubber, gutta-percha and asbestos articles, insulating materials, india-rubber, gutta-percha, insulated and other wires and cables capable of use for telegraphic, telephonic, electric lighting and the conveyance of electricity; electricians, engineers, shipowners, shippers, &c."

The directors are six in number: Mr. Hugo Hirst, Mr. M. Railing, and Mr. E. G. Byng representing the interests of the General Electric Co., Ltd., and Messrs. P. Pirelli, A. Pirelli, and H. Bevis the interests of Pirelli & Co. The erection of works in Southampton on a site adjoining the electric lighting station of that town, and facing the Bay on one side, is proceeding rapidly, and it is expected that the manufacture of all classes of cable, including vulcanised rubber wires and lead-covered cables, will be started in May or June. The buildings should be complete by the end of March. The General Electric Company, in the course of their business at home, and also in connection with contracts abroad, require large quantities of cable of all classes, but have hitherto not manufactured themselves, and it is, we understand, chiefly with a view to supplying their requirements that the new works are being erected.

## LOCAL NOTES

**Aldershot: Diesel Engine Vibration.**—Some inconvenience has been caused at the electricity works alleged to be due to the Diesel engine sets, and the Diesel Engine Co. is sending down a special representative to investigate the probable cause.

**Blackpool: Rateable Value System of Charging.**—The Corporation has adopted a  $12\frac{1}{2}$  per cent. rateable value system of charging for electric supply plus  $\frac{1}{4}$ d. per unit. Under this tariff, of course, current can be used through one meter for any purpose.

**Braintree: Electric Supply.**—Although the Special Committee which is considering an electric supply installation has visited a number of towns, it has been decided to interview a number of other station engineers before finally reporting upon the matter.

**Glasgow: Hiring Electricity Apparatus.**—A special sub-committee has been appointed to report as to the advisability of the Electricity Committee letting out heating and other domestic appliances, as is done by the Gas Department.

**Grimsbay: Street Lighting.**—The Electricity Committee has reported, in regard to a suggestion that the prices for street lighting shall be reduced, that it is unable to recommend this at present. The existing charge averages £19 per lamp per annum for arcs, and the total revenue from this source is £1,609. The charge for street lighting by metal filament lamps is £2 17s. 6d. per 3,000 hours, the same as that charged by the Gas Company, and in both cases the Committee is of the opinion that the charge is a moderate one.

**Leicester: Street Lighting.**—As the result of complaints of the inequality in the street lighting, a special committee was appointed by the Watch Committee some time back to bring forward a re-organised scheme. This has now been prepared, and will consist of first and second grade schemes for the main streets and ordinary streets respectively, whilst the still smaller thoroughfares come within another category. Before developing the scheme, however, it has been decided to make public tests of electricity and gas.

**Liverpool: Electric Lighting Profits.**—It is calculated that £25,000 will be available for relief of rates from the Liverpool electric supply undertaking for the year 1913-14.

**Scarborough: Proposed Purchase of Supply Co.**—The Corporation is now considering a report from their consulting engineer with regard to the proposed purchase of the Scarborough Electric Supply Co.'s undertaking.

**Southampton: Financial Position of Electricity Undertaking.**—We reported a week or two ago a difference of opinion between the Chairman of the Electricity Committee and Mr. H. F. Street, the Borough Electrical Engineer, as to the wisdom of increasing the charge for current for heating and cooking purposes. The Chairman of the Electricity Committee has now succeeded in having instructions given

to the Borough Treasurer to report upon the financial position of the electricity undertaking.

**Stirling: Electricity Charges.**—During the recent negotiations between Mr. George Balfour and the Corporation concerning the suggested purchase of the undertaking, certain terms were put forward by Mr. Balfour which would have reduced the charges to the consumers. The scheme for the purchase, however, has fallen through, but some 300 consumers have now petitioned the Town Council urging that similar terms to those suggested by Mr. Balfour should be offered to them by the Corporation. The matter has been referred to the Lighting Committee for consideration, and the Borough Electrical Engineer has been empowered to arrange terms with consumers where the circumstances of supply are special.

**Tynemouth: Electricity Accounts.**—The figures for the last completed financial year of the Corporation electricity undertaking show a net profit of £945 compared with £1,305 for the previous twelve months. There was a considerable increase in the lighting consumption, but a reduction in the power supply, owing to there being less night work at the various factories in the town than in the previous year.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £67 5s. to £67 10s. (last week £66 10s. to £67).

**Staff Dinner.**—On Friday last, at the Clarendon Restaurant, Hammersmith, the staff and directors of Messrs. Evershed & Vignoles, Ltd., met for their first staff dinner. The chair was taken by Mr. S. Evershed, who, in responding to the toast of the firm proposed by Mr. F. Martin, gave an interesting account of the history of the company, and mentioned that during its career of 20 years the output had increased ten times. A concert arranged by Mr. H. Blundell followed.

**Half-Watt Lamps.**—The London Electric Warehouse Co. (Manners Street, York Road, S.E.) inform us that they are now in a position to quote for export requirements in half-watt lamps in any voltage from 600 to 3,000-c.p., as well as their standard "Metallum" drawn-wire lamps.

**Liquidations.**—In the liquidation of the Prested Miner's Gas-Indicating Electric Lamp Co. a deficiency of £18,896 is shown in the statement of affairs.

**Melbourne Electric Supply Co.**—Applications have been invited for £150,000 five per cent. consolidated debenture stock at 97½.

## NEW COMPANIES

**IRISH TOWNS ELECTRIC LIGHT & POWER CO.** 1 Wellington Place, Belfast. Capital, £5,000.

**ALEXANDRA ELECTRICAL & ENGINEERING WORKS.** Station Road, Letchworth. Capital, £500. To take over an existing business.

**CARLETON ELECTRICAL CO.,** 569 Garratt Lane, Earlsfield, Surrey. Capital, £20,000. To take over certain patent rights for improvements in dynamos, train-lighting systems, &c.

**"Ford" Electric Automobiles.**—According to the *Electrical World* (New York), Mr. Henry Ford, of Detroit, Michigan, will shortly begin the manufacture of a light electric automobile to be sold at between \$600 and \$1,000, i.e., about £150. It is proposed to produce a "runabout" car weighing half a ton, including the Edison nickel-iron battery, which accounts for 405 lb. It is anticipated that runs of 100 miles on one charge will be obtained. An experimental car is now being tested on the streets of Detroit.

**"Half-Watt" Lamps in America.**—The first nitrogen-filled lamps are now in use for street lighting in Seattle, Washington. They are of 80 c.p., and take 6·6 amperes at 8 volts. There are five lamps to each post, and in each pole base is a 250-watt transformer fed at 120 volts. The lamps are run in parallel on the 8-volt secondary. These transformers were installed in 1909 to feed 8-volt "one-watt" lamps. It is reported that the average life of these lamps was over 4,000 hours, and two burned for 12,000 hours and were not then damaged, but were only removed to make room for the new lamps.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 371 [VOL. X., No. 6]

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THURSDAY, FEBRUARY 5, 1914.

[PRICE ONE PENNY.

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 6800 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).


## SUMMARY

THE London Electrical Masters' Association have agreed not to discuss with the workmen's representatives any questions as to the wages of central station employees. Some of the statements which have been circulated with regard to the strike, and threatened strike, of electrical workers are absolutely untrue. At present a number of wiremen who were engaged on buildings upon which all work has been suspended on account of the building lock-out are out of work—that is all. (Page 74.)

A CONSTANT pressure A.C. transmission system, in which a leading current is fed into a line of high reactance, was described by Mr. E. P. Hollis in a Paper read before the Newcastle Section of the Institution of Electrical Engineers. Two constructions of large air core reactance coils were also given. In one bare cable is wound over a concrete core provided with resin-filled maple supports, and in the other the cable is wound spirally in a porcelain insulator. (Page 75.)

FIGURES of the energy lost in plain and ball bearings, and other information regarding ball bearings generally, will be found in our Questions and Answers columns. (Page 75.)

A PATENT by H. Bremer relating to flame arc lamps expires during the current week after a full life. The specifications published by the Patent Office last Thursday include one by C. O. Bastian for the manufacture of resistance helices for heating elements, and one by E. M. Fraser for a two-motor lift equipment. Two patents by C. W. Read relate to strengthening metal filaments and to making the central stem of the

 **BINDING "ELECTRICAL ENGINEERING."**—Vol. IX. of "Electrical Engineering" (Jan.—Dec. 1913) closed with our issue of December 25th, 1913. Readers can have their volumes bound by their own bookbinder; or, they may send their numbers to THE KILOWATT PUBLISHING CO., LTD., Temple Chambers, London, E.C., carriage paid (with the reader's name and address), and a remittance of 4s. 6d. under separate cover. The volumes will then be bound and returned carriage paid to any address in the United Kingdom, or carriage forward to the Colonies or abroad. Binding Cases (including index, but not including binding) 2s. each, or post free 2s. 4d. (Abroad 2s. 6d.) Index alone, 1d. (Post free 2d.).

spider for metal filament lamps of a cylindrical silvered reflector. (Page 77.)

HIGH-PRESSURE direct current with overhead contact line is recommended by Mr. C. H. Merz for the electrification of the Bombay suburban railways. A return of nearly 9 per cent. on the capital outlay is expected.—The report of the East London Railway for the first seven months' electrical working states that there has been an increase in the number of passengers carried and in the revenue, but the increase is not yet sufficient to provide an adequate return on the capital sunk in the electrification.—A conference of police, road, tramway, and omnibus authorities is being convened to arrive at mutual arrangements as to stopping places, &c.—The Dublin United Tramways Co. is only able to pay a dividend of 5½ per cent. for 1913, owing to the strike troubles. (Page 78.)

IN the course of a Paper on loaded aerial telephone lines, read before the Institution of Post Office Electrical Engineers, Mr. J. G. Hill mentioned that Pupin coils are generally spaced about 2½ miles apart. The Post Office will soon have 70,000 miles of loaded underground circuits, as well as submarine cables and a few aerial lines.—Wireless telegraphing between moving trains and stations near the track has been successfully achieved on the Delaware, Lacawanna, and Western Railway of America.—A committee has been appointed by the Post Office to inquire into the systems of high-speed telegraphy. (Page 78.)

A PAPER by Mr. J. F. Aust deals with some practical notes on colliery electrical equipment. The author points out the necessity for reliable signalling systems, and insists on perfect insulation being maintained. A satisfactory method of fixing lamps to girders is described, and an armature fault tester illustrated. (Page 80.)

THE coroner's jury in the Senghenydd disaster was unable to state whether the gas was ignited by sparks from a signal wire, but considered that the evidence pointed to a naked light at the lamp station as the cause of the explosion. The Home Office inquiry is proceeding. (Page 79.)

A PATENT specification relating to "gate end boxes" was published by the Patent Office last month. Two other specifications relating to miner's safety lamps were also published. Several specifications of interest to electrometallurgists were also published. These deal mostly with furnaces, and with the production of high grade steel. (Page 81.)



A SWITCHBOARD at a copper mine is illustrated. (Page 81.)

DESCRIPTIONS are given in our Trade Section of some new metal filament lamps which concentrate the light in the axial direction, and of a fitting for half-watt lamps. (Pages 81 and 82.)

New plant, mains, &c., are required at Accrington (£33,500); Haslingden (£8,200); Taunton (£4,950); Peterborough (£850); Croydon, Hornsey, Rhondda, Wrexham, Stockton, and Ipswich. 20,000-volt and 1,500-volt cables are required for the Melbourne Electric Railways, and D.C. motor-starters by the N.S.W. Railways Department. (Page 83.)

Two independent experts are to report upon the Southampton electricity undertaking.—A scheme for dealing with the Eastbourne mains is being drawn up.—Progress is being made with the Wood Green electric lighting undertaking.—There has been a demonstration of electric vehicles in Ipswich. (Page 84.)

AN issue of new capital is being made by the Victoria Falls & Transvaal Power Co. (Page 84.)

## THE UNREST AMONG ELECTRICAL WORKMEN IN LONDON

MR. HORACE BOWDEN informed us yesterday that he had resigned the Chairmanship of the London Electrical Masters' Association, and that the Association had agreed that they would not discuss with the workmen's representatives any questions as to the wages and status of central station employees. Mr. Bowden is also about to resign from the Committee, and Mr. L. L. Robinson (Borough Electrical Engineer, Hackney) and Mr. L. H. Hordern (Westminster Electric Supply Corporation) have already resigned from it, so that the Committee is now only representative of the wiring contractors. The only other supply representatives in the Association at present are Mr. A. H. Seabrook (Marylebone) and Mr. A. J. Fuller (Fulham). The Westminster Co. has retired from the Association altogether, so that there are no supply company representatives in it, and it is not improbable that the representatives of the Borough Council Electricity Departments will follow suit. A meeting to discuss the matter was held yesterday afternoon, but had not concluded when we went to press.

On the side of the officials of the Association of Electrical Station Engineers (the Association of central station hands referred to in our last issue) there is now also a clear indication that they do not desire to be drawn into the present dispute, which turns mainly on wiremen's wages, recognition of the Electrical Trades Union (which is the wiremen's union), and the position of the wiremen with regard to the dispute in the building trades. Last night a general meeting of this Association was held, at which the following resolution was down for discussion:—

Owing to the fact that the London Electrical Masters' Association does not appear to represent the supply authorities of London and Greater London, this meeting instructs the London Committee of the Association of Electrical Station Engineers to circularise all supply authorities, asking them to form a committee to discuss with the A.E.S.E. conditions of working, hours of labour, and rates of pay.

In the meantime we are asked by Mr. W. J. Ebben, the Hon. Sec. of the Association, to repudiate statements which have been circulated that the Association is amalgamating with the Electrical Trades Union; and we can equally deny the statements, deliberately put into circulation by those whose interest it is to magnify the present dispute, that the Association of Central Station Engineers may be relied on to co-operate with the Trades Union, and to call out its members in sympathy with the wiremen, so as to threaten a stoppage of electricity supply, trams, and tubes in the metropolis. There is not a vestige of truth in this. Central station employees, whether members of this Association or not, are too sensible to allow themselves to be made a "cat's-paw," and to risk losing their employment merely so as to interest the general public in the dispute in the building trade.

So far as the wiremen's dispute itself is concerned, matters are practically where they were last week. Owing to the

building lock-out, it is difficult to find employment for a number of wiremen who would otherwise be engaged, and it seems to have given satisfaction to the Electrical Trades Union to say that the men out of work have struck in sympathy. There may have been isolated cases of this, but in general, we understand, those men who are out of work are simply idle because all operations on the buildings upon which they had been engaged are suspended.

The London Electrical Masters' Association held a private meeting on Tuesday, to which Press representatives were not admitted; but whether they have decided to meet representatives of the Trades Union or not, they will, of course, adhere to the agreement mentioned in the opening of this article not to discuss with them matters relating to the central station workmen.

Mr. W. G. Sutton (Senior Charge Engineer of the St. Pancras Borough Council Electricity Works) writes us as follows:—

"In your issue of the 29th, in a report of the meeting held at the Memorial Hall on the previous Monday, it was stated that the whole of the employees in the Electricity Department of the St. Pancras Borough Council had joined the Union. On behalf of the generating staff you must allow me to correct this statement, or rather misstatement. In the generating stations the Electrical Trade Union have not one member, or prospective member. Also there were none of the generating staff present at that meeting. I think the speaker on that occasion should have verified the facts of the case before making misleading statements."

The announcement in question was formally made by the District President of the Electrical Trades Union, in the course of the meeting in question. Incorrect and misleading statements of this nature will certainly not enlist sympathy for the Electrical Trades Union. Nor is the statement correct if applied only to the outside staff of the electricity department (jointers, meter readers, &c.), for we are informed that less than 10 per cent. of the comparatively small number of men so engaged are members of the Union.

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, FEBRUARY 5TH.

*Institution of Electrical Engineers.*

7 for 7.30 p.m. Annual dinner at Hotel Cecil.

FRIDAY, FEBRUARY 6TH.

*Institution of Electrical Engineers: Scottish Students' Section.*

8 p.m. At Royal Technical College. "Wireless Telegraphy," by D. J. MacKellar.

MONDAY, FEBRUARY 9TH.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College. "Suggested Methods of Improving the Telephone Service," by W. Aitken.

*Institution of Post Office Electrical Engineers.*

6 p.m. At Institution of Electrical Engineers. "A Modern P.O. Wireless Station," by F. Addey.

TUESDAY, FEBRUARY 10TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At University. "The Cascade Induction Motor," by L. J. Hunt.

WEDNESDAY, FEBRUARY 11TH.

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At the University. "Some Railway Conditions governing Electrification," by Roger T. Smith.

*Institution of Electrical Engineers: Yorkshire Section.*

7.15 p.m. At Philosophical Hall, Leeds. "The Cascade Induction Motor," by L. J. Hunt.

THURSDAY, FEBRUARY 12TH.

*Institution of Electrical Engineers.*

8 p.m. "Some Railway Conditions Governing Electrification," by Roger T. Smith.

FRIDAY, FEBRUARY 13TH.

*Royal Institution.*

9 p.m. Evening Discourse by Prof. J. Norman Collie, F.R.S., on "Production of Neon and Helium by Electric Discharge."

SATURDAY, FEBRUARY 14TH.

*Royal Institution.*

3 p.m. Afternoon Lecture I, on "The Electric Emissivity of Matter," by Dr. J. H. Harker, F.R.S.

## REACTANCE COILS IN POWER CIRCUITS

A PAPER entitled "Reactance and Reactance Coils in Power Circuits" was read by Mr. E. P. Hollis before the Newcastle Section of the Institution of Electrical Engineers at Newcastle, on January 26th. It was also read at Middlesbrough on January 30th. The author reviewed the part played by inherent and added inductance in the phenomena that occur in power circuits. In order to promote general stability, inductance coils are now largely used, especially on large transmission and distribution schemes. Besides the use of reactance coils connected to generators, motors, and transformers to minimise the effects of bad switching, to protect the machines in case of short-circuit, &c., they are used with circuit-breakers having two contacts. When the first opens inductance is put in series with the load. The second then opens the circuit. For transformers, concluded the author, it is better to obtain any large amount of reactance by the aid of external coils, and if the risk of internal disorders is considered immediate the transformer should be protected by a shunted discharger. A scheme of constant pressure transmission was also outlined. The theory on which the proposals are based is that a leading current flowing through a reactance experiences a rise in pressure. In most lines it would be necessary to add reactance coils in series, preferably at the generating end of the feeders. A frequency of 50 cycles would be better than one of 25. The leading current would be produced by synchronous condensers, over-excited motor-generators, and (but not advisedly) rotary-converters situated at various points about the system. The short-circuit power would be less than the full-load power, so that there would be no general interference with the system. For the load current the reactance is compensated by the leading current. The author concluded:—"The addition of line reactance together with the introduction of reactive power would appear at first sight to occasion an increased line loss. There is, however, no diminution of efficiency, since, owing to the higher voltage, the same work can be done with a smaller number of amperes, and it is therefore found that the efficiency does not suffer."

The problem of the construction of large adjustable coils appears to be met best by superposing a continuous flux on the alternating flux, so as to give the core a magnetic bias. The coil thus takes a higher magnetising current, but the author does not believe that the potentialities of this method of adjustment have yet been realised. It is cheaper to construct nearly all these large coils with air cores. Several constructions are adopted in practice. In one, bare copper cable is wound under tension on wooden supports covered with asbestos and bolted to a cylindrical concrete cone. Each end-turn is rigidly held by alloy clamps to the wooden supports, which are composed of resin-filled maple, having a disruptive strength of over 75 kv. per in. across the grain and 30 kv. per in., along the grain. In another design the pancake, instead of the drum winding, is adopted. The horizontally wound spirals are supported in recesses formed in porcelain arms which radiate from a central cone of Alberene stone to an outer enclosing well built up of porcelain segments. Concrete headers, one at either end, are fastened to the wall by mica-insulated brass rods.

**The Queen's Engineering Works Magazine.**—An interesting number of the magazine conducted at the Bedford works of W. H. Allen, Son & Co., Ltd., has just reached us. A number of the articles deal with travel, and visits are described respectively to India, the Persian Gulf, Japan (via Siberia), and Palestine. Technical matters dealt with include reports of a lecture on wireless telegraphy by Capt. Sankey at the annual distribution of prizes to pupils and apprentices, and of the summer meeting of the Institution of Mechanical Engineers, the kinetic air pump, modern foundry practice, and the efficiency of slide valves, and one of the most interesting contributions is a vivid account of the part played by the *Iron Duke* in saving the burning *Scotsdyke* during her steam trials. Mr. W. H. Allen also contributes an article on the launch of H.M.S. *Queen Elizabeth*.

**Old Centralians.**—The 16th Annual Dinner of the City and Guilds College Old Students Association will be held at the Trocadero Restaurant, Piccadilly Circus, W., at 7.30 p.m. on Saturday, February 21st, and will be preceded at 6.45 by the Annual General Meeting. Dr. G. T. Moody, D.Sc., F.C.S., President of the Association, will take the Chair. Tickets (price 6s. 6d. each) may be obtained by any old student of the "Central" from G. W. Tripp, 4 Fairfield Road, Charlton, Kent.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,377.

What are the more usual methods, other than the use of automatic regulators, for compounding alternators? How is the compounding effected, and what are the relative advantages of the different methods? Also, is it practicable to "over-compound" a machine in this way.—"F. M."

(Replies are limited to 800 words, and must be received not later than first post, Thursday, Feb. 12th.)

### ANSWERS TO No. 1,375.

Give particulars of any rules or curves showing the power lost (in watts) in ring lubricated brass bearings, compared with the power lost in ball bearings suitable for the same load and speed. Compare also the probable life of the above two types of bearings. If possible tabulate the minimum number of balls per bearing and diameter of each ball and ball race, against maximum load per bearing and maximum safe speed of the inner ball race for both ball and thrust bearings. Is the true spherical, or elliptical, shape of ball race the most reliable? When is it advisable to depart from ball to roller bearings?—"F."

The first award (10s.) is given to "MARF" for the following reply:—

The following table is the result of tests conducted at the National Physical Laboratory on ordinary brass bearings and ball bearings. The journal in each case was 2½ in. dia., loaded up to 2,300 lbs., and supported, first, by two ordinary bearings, and afterwards by two of the ball-bearing type. The ordinary bearings were three diameters long, fitted with two oil rings for automatic lubrication. The ball bearings were of the "Hoffmann" type:—

Speed in R.P.M.	Load per Bearing	Coefficient of Friction.		Power lost in Friction	
		Ordinary	Ball Bearing	Ordinary	Ball Bearing
80	1,150 lbs.	·015	·0013	20 Watts.	1·78 Watts.
130	"	·014	·0014	30·7 "	3·07 "
250	"	·013	·0015	55·3 "	6·25 "
500	"	·012	·0016	102·2 "	13·6 "

The life of a ball bearing depends almost entirely on the conditions of working. Provided it is not overloaded or subjected to shocks, the amount of wear is practically nil; a small amount of end thrust, or overloading, will, however, quickly ruin the most carefully made ball bearing.

The sizes in the following table have been compiled from recent practice, and the safe loads were computed from the formula established by Mr. R. Stribeck:—

$$\text{Safe load} = k n D^2,$$

where  $k=9$  for bearings provided with ball cages,  $n$ =number of balls, and  $D$ =diameter of balls in eighths of an inch.

It will be seen that the loads thus found agree quite well with the formula lately put forward by Professor Goodman:—

$$P = \frac{K n d^3}{N D + C d}$$

where  $P$ =max. safe load on bearings in lbs.,  $d$ =dia. of balls in inches,  $D$ =dia. of ball race,  $m$ =number of balls in bearing,  $N$ =revs. per min.,  $K=1,250,000$  for thrust bearings or 2,500,000 for journal bearings, and  $C=200$  for thrust bearings or 2,000 for journal bearings (see Fig. 1).

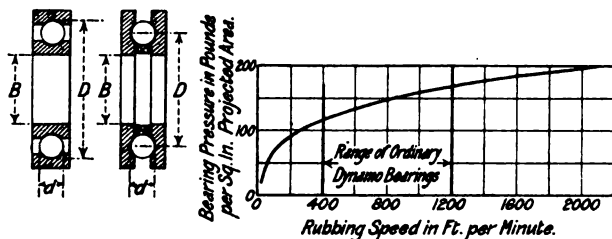
Table for Radial Ball Bearings.

Size of Shaft B in inches	Dia. of Ball Race D in inches	Dia. of Balls d in inches	No. of Balls	Safe Load.		
				R. P. M.		
				300	600	1,200
$\frac{1}{2}$	$1\frac{1}{8}$	$\frac{7}{16}$	8	405 lbs.	250 lbs.	140 lbs.
1	$2\frac{1}{8}$	$\frac{7}{16}$	10	980 "	610 "	350 "
2	$3\frac{1}{8}$	$\frac{7}{16}$	14	2,550 "	1,750 "	1,050 "
3	$5\frac{1}{8}$	$\frac{7}{16}$	16	5,600 "	3,920 "	2,200 "
4	$7\frac{1}{8}$	1	16	7,850 "	5,776 "	3,550 "

Table for Thrust Ball Bearings.

Size of Shaft B in inches	Dia. of Ball Race D in inches	Dia. of Balls d in inches	No. of Balls	Safe Load.		
				R. P. M.		
				150	300	1,200
$\frac{1}{2}$	$1\frac{1}{8}$	$\frac{7}{16}$	8	330 lbs.	285 lbs.	217 lbs.
1	$2\frac{1}{8}$	$\frac{7}{16}$	10	620 "	525 "	451 "
2	$3\frac{1}{8}$	$\frac{7}{16}$	14	1,650 "	1,250 "	975 "
3	$5\frac{1}{8}$	$\frac{7}{16}$	16	3,450 "	2,600 "	2,170 "
4	$6\frac{1}{8}$	1	16	4,400 "	3,500 "	3,100 "

Light gunmetal cages should be used to keep the balls apart. For a given number of balls, the elliptical form of ball-race is more reliable than the spherical form, because it affords a larger arc of contact with each ball, and consequently will support a bigger load. The friction is rather more for elliptical



RADIAL THRUST BEARING. BEARING.  
FIG. 1.

FIG. 2.—PERMISSIBLE BEARING PRESSURES FOR VARIOUS RUBBING SPEEDS FOR JOURNAL BEARINGS.

(or, strictly speaking, "ellipsoidal") races than for spherical ones. The tables given above are based on the assumption that elliptical races are used, the smaller radius of curvature being  $\frac{1}{8}$  × diameter of ball.

The second award (5s.) is made to W. A. WOOD, who writes as follows:—

In designing journal bearings, neither the pressure nor the circumferential speed alone can serve as a standard for calculating dimensions. The product of the pressure by the speed and the coefficient of friction must be taken into account; this is the work of friction. With this type of bearing, running at a high rubbing speed, the dissipation of heat becomes an important problem, and in many cases cooling devices by the circulation of water or oil have to be resorted to. On the other hand, with properly designed and operated ball and roller bearings, the amount of energy liberated in heat is so slight that it is a negligible factor in design.

Turning now to the watts lost in bearings, if  $f$ =coefficient of friction,  $W$ =load in pounds,  $d$ =diameter in inches, and  $n$ =number of revolutions per minute, we have

$$\text{Watts lost} = \frac{f\pi dn W \times 746}{12 \times 33,000} = .0059 f dn W.$$

Thus, with the same load and r.p.m., the relative losses in journal and ball bearings will vary as the coefficients of friction and the radius at which this acts. In the case of ball bearings, this radius will be from 1.8 to twice that of journal bearings.

To find the value of  $f$  for journal bearings, care must first be taken to select a suitable bearing pressure for the particular speed at which the shaft runs. Fig. 2 shows this relationship to ensure perfect film lubrication. Having selected this, Fig. 3 shows the relationship between the pressure density and the coefficient of friction.

It will be noted that for moderate pressures and speeds the coefficient of friction varies, approximately, inversely as the

normal pressure, but is very high for low speeds, and for very high speeds is approximately independent of the velocity.

Turning now to ball bearings, great care must be taken to ascertain whether the shaft is liable to be subjected to any end thrust, since even if this be present to a very slight degree, the coefficient of friction is raised enormously. Fig. 4 illustrates this characteristic. If it is thought that no end thrust will be present, 0.002 will be a fair value to take for any speed.

The governing principle in regard to the shape of the races is that the ball shall roll over them, and not slide. If it were possible to so shape the groove that all parts would sustain the load equally, we would have a condition of maximum sustaining capacity of the ball. Such a groove would be represented by a profile semicircular in section, with the radius of curvature equal to one-half the ball diameter. Because of excessive friction, this form is not practicable. This is one limit. Turning to the other limit, if we begin with a cylindrical race the sustaining power increases without a proportionate increase of friction as the curvature is increased up to the point of equality of curvature, when sliding sets in, and with that a change from rolling to sliding friction. For best proportions the radius of curvature for outer race groove =  $\frac{1}{8}$  ball diameter, and that of the inner groove  $\frac{1}{16}$  ball diameter.

According to Professor Stribeck, the capacity of a ball bearing in pounds =  $k\pi D^2$ , where  $n$ =number of balls,  $D$ =diameter of ball in inches, and  $k=580$  when no end thrust is present, to 60 when end thrust takes place.

For thrust bearings, account must be taken of the speed.

Thus, permissible load in pounds =  $30,000 \frac{nD^3}{a\sqrt{s}}$ , where  $D$ =ball

diameter in inches,  $n$ =number of balls,  $a$ =pitch diameter of the ball grooves in inches, and  $S$ =speed of shaft in revs. per minute.

The following are corresponding formulæ for roller bearings, and are based upon careful records of a large number of bearings in successful use:—

$$\text{Capacity in pounds} = 130,000 \frac{d^2 n l}{3s}$$

where  $d$ =diameter of rollers in inches,  $n$ =number of rollers,

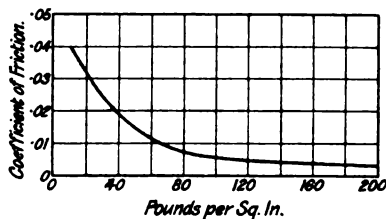


FIG. 3.—RELATION BETWEEN BEARING PRESSURE AND COEFFICIENT OF FRICTION FOR LUBRICATED JOURNAL BEARINGS.

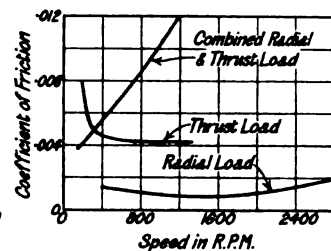


FIG. 4.—COEFFICIENT OF FRICTION FOR BALL BEARINGS UNDER VARIOUS CONDITIONS.

$b$ =length of each roller in inches,  $S$ =circumferential speed in feet per minute of each roller; while for thrust roller bearings

$$\text{Capacity} = 100,000 \frac{d^2 n l}{s}$$

As to the choice of any particular type of bearing, many factors present themselves, ring lubricated plain bearings being selected for cheapness and moderate speeds, while if easy starting is essential, ball bearings, or roller bearings for heavier loads, must be used. The latter types generally require far less attention than journal bearings, but extreme care must be taken to ensure perfect alignment, and that no moisture is allowed to enter the races. With regard to the probable life of journal bearings, theoretically speaking, no wear should take place, since if properly proportioned a film of oil should prevent actual metallic contact between the shaft and brasses. In actual practice, however, these conditions may be upset by jars, radial overloading due to unbalanced centrifugal forces, and grit. With ball and roller bearings the same remarks apply, with this disadvantage, that once the races and balls are scored or worn, they must immediately be discarded for new ones, whereas split bearings can often be adjusted and trimmed up. It is always advisable to use ball bearings for taking continuous thrusts. I regret I am unable to discriminate between the limits of ball and roller bearings, as each particular scheme must be considered on its own merits.

**Boiler Explosions.**—The Manchester Steam Users' Association has issued its annual memorandum by its chief engineer, Mr. C. E. Stromeyer. The memorandum analyses and correlates a large number of experiments on the strengths of flat plates, including those carried out nearly 40 years ago in consequence of the explosion on board H.M.S. *Thunderer*, as well as experiments carried out by the Board of Trade, the German Admiralty, the Association itself, and by private individuals. Results are arrived at which should be of great use to steam users in general and to designers and constructors of boilers. The address of the Association is 9 Mount Street, Albert Square, Manchester.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Jan. 29th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

8,144/12. **Heating Elements.** C. O. BASTIAN. A wire is wound on a mandril with its contiguous convolutions actually in contact. The mandril is removed and a coating of the oxide of metal of which the wire is composed is formed on it by heating for about five minutes in a flame or muffle. Two figures.

27,859/12. **Tungsten for Drawn Wire Filaments.** C. GLADITZ. An abstract of this specification will appear next week.

49/13. **Indicating Temperature and Hygrometric Condition of Halls, &c.** L. E. HILL. A wet-bulb thermometer of special construction has a resistance in an electric circuit in it, and means are provided whereby the resistance of an adjustable rheostat in the circuit is increased or decreased upon the temperature of the thermometer rising or falling from a predetermined point through a polarised electromagnet. A recording ammeter or wattmeter in the circuit may be calibrated to show "degrees of comfort." Three figures.

235/13. **Luminous Speed Indicator.** F. FAIGLE. The indications, by means of differently coloured signals, are perceptible during equal units of distance in vehicles or for a constant number of revolutions in the case of stationary machines. The lamps are connected to contact studs which are alternately bridged by a switch driven from the vehicle wheels or their equivalent. Several modifications are described. A watch or clock is necessary to calculate the speed from the indications given. Twenty-six figures.

736/13. **Wireless Radiator for Aeroplanes.** SIGNAL GES. The surface of the aeroplane is made conducting so as to serve as one member of the radiating system, and the other member is elevated over the aeroplane by masts, rods, &c., e.g., a mast near the centre of the aeroplane has wires from its cap to the further ends of the surfaces of the machine. These wires are divided into two parts by strain insulators. One figure.

7,151/13. **Control of High-Frequency Alternating Currents.** B.T.-H. Co. (*G.E. Co., U.S.A.*). To control the output from a high-frequency generator, two reactance coils in series are provided in its circuit, and these are subjected to the magnetising action of a pulsating controlling current. This acts in opposite ways on the two coils. Five figures.

11,874/13. **Vacuum Cleaner.** A. G. BLOXAM (*Bergmann A.-G.*). A heating element is inserted in the air pipe of a suction cleaner. It is connected in series with the driving motor, and is preferably placed in the pressure pipe in place of the dust-collecting vessel.

13,447/13. **Lifts.** E. M. FRASER. The armature shafts of two motors with rotating fields are mechanically connected so that one machine will always act as a motor when the other acts as a dynamo. The reactive thrust of the armature on the fields is transmitted to a lift car and counterweight. Control is effected on the two fields. Three figures.

13,695/13 and 16,770/13. **Metal Filament Lamps.** C. W. READ (F. & E. Stanton, Armoury Mills). Filaments are strengthened by being flattened and made concave by pressure or by passing through rollers or dies. According to the second specification, a hollow cylindrical silvered reflector fused to the lamp pip is used as the stem of the spider. It has a longitudinal slip to provide for expansion. There are two figures to each specification.

22,029/13. **Track Circuit Railway Signalling.** SOC. ANON. WESTINGHOUSE. In specification 27,276/11 a resistance with positive temperature coefficient is used to keep the signalling current constant. In this specification the use of a resistance with negative temperature coefficient is claimed.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** DATTA [Machines for giving conductors a fibrous covering] 1,343/13; PEARCE and WILKINSON [Arc lighting] 6,964/13.

**Dynamos, Motors, and Transformers:** MEYERS [Apparatus for producing electricity] 1,098/13; VON ZWEIFBERGK [Brush-holders] 1,337/13; SIMMS [Magnets for ignition and lighting combined] 1,501/13; RATLING and GARRARD [Current equalising in rotary converters] 11,905/13.

**Electrometallurgy and Electrochemistry:** LEE and BRAME [Electroplating] 13,747/12; HENRI, HELBRONNER and VON RECKLINGHAUSEN [Sterilisation] 28,660/12; WHITE [Production of alkali compounds] 1,935/13; NODON [Electrical treatment of cellulose] 6,668/13.

**Ignition:** UNITED MOTOR INDUSTRIES and DE RODAKOWSKI [Spark plugs] 20,929/13.

**Incandescent Lamps:** GLADITZ [Wire-drawing] 8,288/13; SIEMENS BROS. (*Siemens & Halske*) [Fusing tungsten] 10,369/13.

**Instruments and Meters:** LANDIS & GYR [Base plate] 15,811/13.

**Switchgear, Fuses and Fittings:** OLMSTED and BOOTHMAN [Motor controllers] 745/13; PHILLIPS [Candle lamp-holder] 2,764/13; BOON and WILKINSON [Anti-vibration lamp-holders] 5,494/13; CUMONT [D.C. motor controllers] 7,983/13.

**Telephony and Telegraphy:** WESTERN ELEC. CO. (*Western Elec. Co., U.S.A.*) [Paper roll holder for printing-machines] 999/13; [Selective impulse transmitters] 9,703/13; PECORINI [Loud-speaking telephone for closed vehicles] 1,069/13; PALMER [Telephone transmitters] 8,841/13; CONNER and KAHL [Telephone indicators] 9,818/13.

**Traction:** BULFIN [Connection of motors on rail vehicles to prevent side swing] 672/13; ANDERSON [Trolley wheels] 17,850/13.

**Miscellaneous:** MOORE-LICHT A.-G. [Vacuum tube lighting] 1,218/13 and 8,712/13; ELIA [Submarine mines] 1,316/13, 1,327/13, and 1,333/13; ALEXANDER (*Anderson Winding Machine Co.*) [Coil winding machines] 3,515/13; RHEINISCHE-METALLWAAREN UND MASCHINENFABRIK [Setting key for fuses] 18,424/13; NEU [Portable lamps] 22,707/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** ESTÈVE [Lamps fed by induction apparatus driven by irregular actuating means] 133/14.

**Dynamos and Motors:** SIEMENS-SCHUCKERT [Braking A.-C. commutator motors] 299/14.

**Electrometallurgy and Electrochemistry:** RENNERFELT [Furnaces] 226/14; PERMUTIT A.-G. [Alumino-silicates] 353/14.

**Ignition:** WULYAMAZ [Starting motors] 29,715/13.

**Incandescent Lamps:** VEREINIGTE GLANZSTOFF FABRIKEN A.-G. [Manufacture of filaments from crude viscose] 826/14 and 834/13.

**Switchgear, Fuses and Fittings:** BOSCH [Container for granular resistance varied by pressure] 28,824/13; BROWN, BOVERI [Liquid resistances] 29,713/13.

**Telephony:** SIEMENS & HALSKE [Party line] 24,333/13.

**Miscellaneous:** KERSCHBAUM [Metallic vapour lamp] 11,991/13; FRIEDR. KRUPP [Destroying residual magnetism] 28,715/13; KRANSHAAR [Miners' safety lamp] 134/14.

The following Amended Specification may now be obtained:—  
**Switchgear, &c.:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Dynamic braking and control of planing machine motors] 22,664/12.

### Application for Restoration of Patent

26,042/07. **Fire Indicators and Extinguishers for Ships.** W. RICH. The patentee has made application for restoration of this patent, which expired on November 25th, 1911, owing to the non-payment of the renewal fee. Notices of opposition before March 23rd.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

2,260\* of February 5th, 1900. **Flaming Arcs.** H. BREMER. The carbons may be vertical or inclined, and are both burned together equally. Cylinders are arranged to surround one or both of the carbons, and are closed at the top ends to intercept the air current and prevent it reaching the arc. This specification originally contained eight claims, but six of these were struck out, and the remaining two amended in 1908.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, &c.:** W. F. GRADOLPH and W. C. HAHNE [Reducing induction in telephone and A.C. lines] 22,737/07.

**Electrochemistry and Electrometallurgy:** C. BENSINGER [Electrotype moulds] 22,014/08.

**Ignition:** F. W. HOWORTH (*M. P. Ryder, U.S.A.*) [High-pressure magneto: The voltage is independent of the engine speed, and magneto may be started by hand] 22,368/04.

**Incandescent Lamps:** P. BANTA [Machine for making small pipless cylindrical lamps] 20,989/05.

**Telephony and Telegraphy:** W. C. FAIRWEATHER (*Kellogg Switchboard & Supply Co., U.S.A.*) [Telephone plugs and jacks: No jack springs, but plug has spring tip] 22,440A/03; I. B. BIRNBAUM and H. G. WHITE [Intercommunication telephone system] 21,995/04; T. A. GARRETT and W. LUCAS [Submarine signalling] 21,727/08; G. BURNBY and W. F. BRINKMANN [Intercommunication telephones: Addition to No. 21,995/04] 25,446/08.

**Traction:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [A.C. track circuit signalling] 21,596/08; R. PETERSEN [Overhead] 21,826/08.

**Miscellaneous:** K. SCHAFFLER and D. WEISS [Shot firer] 22,648/07; A. NEWALL [Anti-vibration suspension] 22,003/08.



## ELECTRIC TRACTION NOTES

Mr. C. H. Merz has now issued his report on the question of converting the Bombay suburban railways to electric traction. The lines involved include those of the Bombay, Baroda, and Central India, and the Great Indian Peninsula Railways, and the Bombay Port Trust. Mr. Merz estimates the cost of conversion at £780,972, and expects an annual saving of £5,158 on the present operating costs, assuming a 20 per cent. increase in average speed, and a much increased train mileage, resulting in additional traffic sufficient to produce a return of 8.98 per cent. on the capital outlay. The overhead wire system, with high-tension continuous-current, is recommended in preference to third rail supply, on account of local conditions. The Great Indian Peninsula Railway has also under consideration the conversion of part of its main line out of Bombay.

The report of the East London Railway Co. for the year to December 31st shows that since the introduction of electric traction on April 1st, 1913, there has been a considerable increase in the number of passengers carried, and also in the net revenue. At the meeting last week, Lord Claud Hamilton, the Chairman, expressed his dissatisfaction with the results of the seven months' electrical working, but thought it only fair to give the new system a longer trial before expressing a definite opinion. Up to the present, however, he was inclined to attribute the result to motor omnibus competition, which, nevertheless, he thought would not be so serious in the future, when the novelty of this form of traction had worn off, and the public realised the extra comfort of travelling in electric trains.

The Midland Railway Co. is said to be contemplating the electrification of its line from St. Pancras to Hendon.

Work has been started upon the first section of the Post Office tube railway, from Paddington to Whitechapel.

In response to representations by the London County Council, the Home Secretary is arranging for a conference between the police, road, tramway, and omnibus authorities in London, with a view to mutual arrangements as to stopping places, &c. During recent years, for some reason the police authorities have been inclined in several places to allocate the present tramway stopping-places to the omnibuses, endeavouring, at the same time, to remove the tramway stopping-places to a less convenient place. Seeing that the tramways had these stopping-places fixed by the Board of Trade long before omnibuses were on the streets, there is, not unnaturally, considerable resentment at the attitude taken up by the police authorities, and this is the most important matter which will be raised at the proposed conference.

As a consequence of the strike troubles, the revenue of the Dublin United Tramways Co. in 1913 shows a reduction of £21,100, whilst the expenditure has increased by £2,410. The  $5\frac{1}{2}$  per cent. dividend recommended is in consequence less than that paid in the previous year.

It is calculated that £100,000 will be available for relief of rates from the Liverpool tramways undertaking for the year 1913-14.

The Anglo-Argentine Electric Tramways Co. is issuing £1,500,000 5 per cent. debenture stock at 95.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The problem of the feasibility of loading aerial lines in this country was dealt with by Mr. J. G. Hill in a Paper read before the Institution of Post Office Electrical Engineers on January 12th. The author first discussed the problems of distortion and attenuation, and deduced simple proofs of the more general and widely used formulae. A large number of careful tests on experimental loaded lines were cited, and the results analysed. The results show that the loading of the longer aerial lines is likely to prove advantageous if the degree of insulation on the main line used in the tests (London to Leeds) can be maintained, as appears likely. Direct comparison between loaded and unloaded circuits, of exactly the same type, showed a distinct degradation of articulation on the loaded circuits, but was "commercially satisfactory." No line, the author said, the transmission efficiency of which was as good as eight miles of standard cable, should be loaded, even if terminal transformers were employed. There does not appear to be so much probability

of the successful working of superimposed or phantom circuits on loaded overhead lines as on underground cables, unless the insulation can be improved. The Post Office has at present over 13,000 loading coils in use in underground circuits, and nearly 15,000 more are in process of installation in lead-covered cables. These are generally spaced two-and-a-half miles apart, so that the Post Office will shortly own approximately 70,000 miles of loaded underground circuits, in addition to the submarine loaded cables and a few aerial lines.

According to the *Electrical World* (New York), wireless telegraphy between moving trains on the Delaware, Lackawanna and Western Railway has proved very successful. The train aerial is carried on the four forward cars, and consists of four horizontal wire rectangles. It aggregates about 250 ft. in length and 10 ft. in width, and is 12 ft. above the rails, but is only 2 ft. from the steel of the cars. The instruments are of 1-kw. rating. The 30-volt train lighting dynamo and storage battery feed a motor-generator set which gives 250 volts at 270 cycles per sec. A ten unit quenched gap and three glass jar condensers of 0.004 mfd. capacity each are used. Wireless stations have been erected along the track. The measure of success obtained may be gauged from the following extract:—"It is now possible to communicate with stations in New York until the train reaches Dover, N.J., about forty miles out. Fifty-three miles further, after passing Stroudsburg, Pa., signals may be sent from the train to Scranton, about fifty miles away, and from that time on Scranton is able to read all that is sent by the train operator. Signals from Scranton are first picked up when the train is near Tobyhanna, about thirty miles away."

The Postmaster-General has appointed the following Committee to inquire into systems of high-speed telegraphy, and to report thereon:—Captain Norton, M.P., Assistant Postmaster-General (Chairman); Sir John Gavey, C.B.; Mr. John Lee, Traffic Manager, Post Office Telegraphs; Mr. W. M. Mordey; Mr. A. M. Ogilvie, C.B., Third Secretary, G.P.O.; Mr. W. Slingo, Engineer-in-Chief, G.P.O.; and Mr. A. B. Walkley, Assistant Secretary, G.P.O.

A Paper by Mr. W. Duddell, published in the *Journal of the Institution of Electrical Engineers*, discusses the most suitable shape for the plates of variable condensers of the rotating sector type in order to ensure that the capacity is proportional to the square of the angle between the systems of plates, which is the most convenient law for practical purposes in wireless telegraphy.

At a special meeting of the Blackburn Chamber of Commerce Telephone Advisory Committee last week, Mr. A. M. J. Ogilvie, G.P.O., stated that a sum of £400,000 is to be spent upon telephone extensions in Lancashire in the near future. An automatic telephone system is to be installed in Accrington very shortly.

**Local Government Board's Sanction for Loans.**—The Council of the I.M.E.A. at its last meeting had under its consideration a communication from the British Electric and Allied Manufacturers' Association, wherein it was pointed out that cases had occurred where local authorities had requested contractors to accept contracts subject to the sanction of the Local Government Board being obtained to the necessary loan, and had requested the contractors to proceed with the work prior to the receipt of such sanction. The I.M.E.A. have agreed with the B.E.A.M.A. that such procedure imposes an unfair liability upon contractors, unless the local authority in question undertakes to recompense the contractor for any "work" so carried out at their request in the event of the contract not being entered into ultimately. The Councils of the respective Associations have therefore agreed that their members should be advised to act in conformity with the foregoing arrangement.

**Ignition of Gas from Signal Wires.**—A series of experiments were made at the beginning of last month at the rescue station of the New Tredegar Collieries, in the Rhymney Valley, by Mr. R. Nelson (H.M. Electrical Inspector of Mines), in the presence of a number of mining and electrical experts, which proved beyond doubt that it is possible for gas to be ignited by sparks produced by the contact of signal wires as used in mines. The gas used in the experiments was obtained from the Cymmer Pit by a blower.

**I.M.E.A. Bill.**—The Incorporated Municipal Electrical Association has been in communication with all the Councils represented in its membership with a view to getting them to secure the support of their Members of Parliament in connection with the Association's Bill next session. The object is to secure a favourable place in the ballot for private members' Bills.

**City and Guilds of London Institute.**—The Institute has now returned to Gresham College, Basinghall Street, E.C., which will in future be the address of its head office.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### COLLIERY ELECTRICAL EQUIPMENT

A PAPER by Mr. J. F. Aust, entitled, "Practical Notes on Colliery Electrical Equipment," was discussed on Saturday at a meeting of the Warwickshire and South Staffordshire branch of the Association of Mining Electrical Engineers. It has also been discussed by some of the other branches. Among the more important items to be considered, said the author, are the shaft signals, which should undoubtedly be electrical. At an inset where the coal-winding is done a main and spare tapper should be mounted, and a guard plate fitted to prevent a signal being accidentally given. A simple

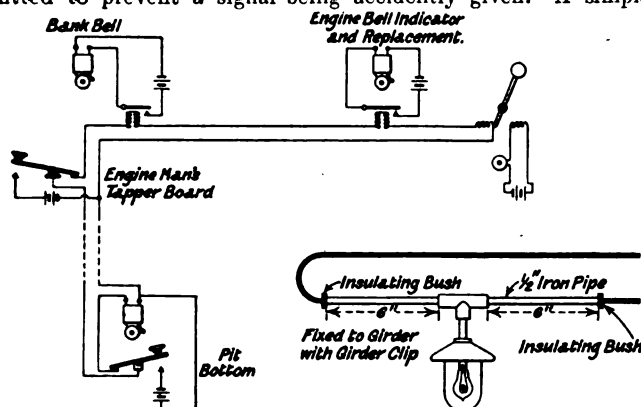


FIG. 1.—RELIABLE SIGNAL-  
LING ARRANGEMENT.

FIG. 2.—SATISFACTORY CON-  
NECTION FOR LAMP.

and reliable system is shown in Fig. 1. An efficient method of carrying the wires down the shaft is to thread the insulated wires through screwed steel tubes. The wires are pulled down as each tube is screwed on, care being taken never to screw the tubes up so as to twist the wires. The tubes are secured to the brickwork by means of crampets driven in at suitable intervals. It is of vital importance that all current-carrying parts of electrical signals should be thoroughly insulated so as to prevent stray current from any source whatever energising the bells or relays. The earth should never be used as a return for shaft signals. Great care should also be taken in giving or receiving telephone messages relative to switching power on or off. The cost of generating one B.O.T. unit by Leclanché cells has been calculated at 25s. From this it can be calculated that the cost of battery power for signalling would be approximately 3d. per 10,000 raps; that is, allowing one second per rap. A good light at the pit-bottom and along main haulage roads is very neces-

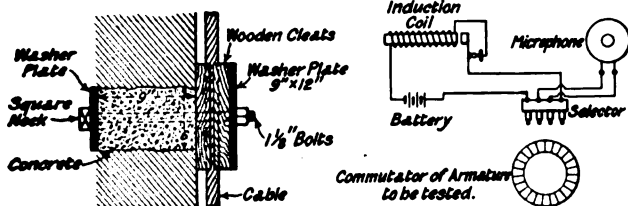


FIG. 3.—CABLE CLAMP FOR  
SHAFT.

FIG. 4.—ARRANGEMENT FOR  
TESTING ARMATURES.

sary. Where the lighting is done from power circuits, bulk-head and well-glass fittings, hermetically sealed and protected by wire guards, and connected five in series on 500 volts, make a satisfactory arrangement. An instance of how some very fine coal dust was fired, owing to a wire having been pulled out from a lamp-holder, is as follows:—The lamps were wired two in series on 500 volts; the bare end of the wire touching the inside of the iron pipe caused a spark to blow out from the open end, which, falling upon an accumulation of coal dust, caused it to smoulder until a three-inch plank was nearly burnt through. No trouble of any description has been experienced by fixing lamps to girders as in Fig. 2. The lamps are supplied with current by double-armoured wire, and the armouring used for the purpose of earthing the lamp

fittings. An efficient means of carrying cables down a pit shaft is by means of concrete blocks, as shown in Fig. 3. The wooden blocks are 9 in. by 12 in., and the fixing bolts are spaced 4 in. apart. It is a far less bulky arrangement than most methods; the cable, being sustained every 10 yds., carries its own weight, reducing the strain on the armouring to a minimum. If the drum of cable is paid out with adequate precautions from the descending cage and cleated up, the possibility of a "birdcage" forming on the cable is avoided. In regard to dynamos and motors, the author urged that it is far more important to see that the machines installed are fit for the work they have to do than to pay excessive attention to efficiency. A small microphone arrangement for detecting short-circuits or open-circuits in the armature is shown in Fig. 4. The selector is placed on four adjacent commutator segments, and should there be a short- or open-circuit under the microphone selector points, it will remain quite silent. Should, however, the coil under test be all right, a loud rapping sound will be heard corresponding to the make and break of the induction coil.

### THE SENGHENYDD COLLIERY DISASTER

THE coroner's inquest on the victims of the explosion which occurred in the Universal Pit, Senghenydd, South Wales, on October 14th last, was concluded on January 14th, after a hearing lasting eight days; and the jury, in finding that the deaths were due to accidental causes, expressed the opinion that there was insufficient evidence to state clearly the place where the explosion originated, but there was a preponderance of evidence to enable them to fix the lamp-station as the probable starting point. They were unable to say whether the gas was ignited by a spark from the electric wire, but the evidence pointed to the naked light at the lamp station as the cause of ignition.

During the evidence it was brought out that bare signal wires were used in the pit, and one witness stated that sometimes he signalled by applying a file to the wire. If he had no file, he would bring two wires together with his fingers. The file gave a clearer ring. He had never seen a spark or a flash when using a file.

The Home Office inquiry conducted by Prof. R. A. S. Rodmayne, H.M. Chief Inspector of Mines, commenced on January 2nd, but was adjourned on the following day to avoid clashing with the inquest. Evidence was also taken on the question of the bare signal wires, but the manager denied having ever seen sparks from them. The inspector took the view that such an unprotected signalling system was a breach of the regulations, and quoted the following regulation:—

"In any part of the mine in which an inflammable gas, although not normally present, is likely to occur in a quantity sufficiently large to be indicative of danger, the following additional requirements should be observed: All signalling wires and signalling instruments shall be constructed, installed, protected, and maintained so that in normal working there shall be no risk of open sparking."

The manager admitted that the bare wire system was in use at the spot where a fall and blower took place four or five years ago, except that the bell was protected, but said that he was putting in a system which would do away with the electrical apparatus.

The inquiry was resumed on January 27th, when reference was made to an accident reported by Dr. Atkinson, Divisional Inspector for South Wales, at a Welsh colliery, where a fatal fire-damp explosion was believed to have been caused by sparking from an electric signalling bell. It had afterwards been proved experimentally that such sparks could cause ignition of gas. On these grounds, it was announced, the Home Office asked for a strict observance of the special rule. The inquiry was continued on Friday last, and after some argument the Commissioner held that the Home Office had no power to grant exemptions to collieries respecting the obligation to instal a telephone service. At Saturday's sitting the Commission protested against inferences from the experiments at the New Tredegar Colliery being published, as the matter was still *sub judice*. The inquiry will be resumed to-day.

**FOR  
BRITISH  
MANUFACTURED  
PAPER  
INSULATED  
CABLES**

**THE UNION  
CABLE  
CO., LD**

**DAGENHAM DOCK,  
ESSEX.**

**ELECTRICAL MINING AND METALLURGICAL  
PATENTS OF JANUARY**

THE following patents made public during January are of particular interest to mining electrical engineers. No. 29,774, of 1912, by the British Insulated & Helsby Cables, Ltd., and R. W. Blades, deals with "gate end boxes" for high or low pressure systems. By the construction described, a hinged catch is adapted to engage with the fuse-box cover, and another works with a removable box connected with a detachable conductor. Both catches are worked simultaneously by the switch handle outside the box, so that a complete interlock is effected. They are locked and released by two other catches, from which they may be disengaged by the box cover. The main terminals may be in a chamber separate from the fuse chamber, and the cover may be locked and released only from within the fuse chamber.

The two following specifications relate to miners' electric safety lamps. No. 6,408, of 1913, is by P. Wolf (Friemann & Wolf Ges., Zwickau, Saxony), and relates to a construction for preventing ignition of gas by sparking during switching. To this end a rotary switch plate is arranged to co-operate with the battery terminals, so that a resistance is placed in the circuit during switching. A main contact and an auxiliary contact are connected in line on the plate through the resistance. No. 16,058, of 1913, by F. Faerber (Dortmund, Germany), describes an arrangement in which the bulb is pressed by a spring against a second spring or the wall of the casing, so that when the glass casing breaks, the bulb is shifted and short-circuits the current through the first spring. The temperature of the filament is so reduced that ignition of gas cannot occur. A fuse is arranged in circuit, so that immediately after the short-circuit the circuit is broken.

Below are notes on the more important patents published during January, having particular bearing on the electro-metallurgical industry. Specification No. 2,718, of 1913, by F. C. Wardale and J. Marchant (Rashcliffe Brass and Iron Works, Huddersfield), describes the combination with an electric furnace provided with a vacuum casing of an alumina tapping tube extending through the furnace linings and their metal container to the base of the hearth. A carbon tube

surrounds that part of the tapping tube which passes through the linings. This is temporarily put into circuit during pouring to keep the tube from getting clogged. A vent hole is provided which has either a valve or was designed to fuse at a given temperature and put the vacuum space round the furnace and tapping tube into communication. Specification No. 9,381, of 1913, by P. Eyermann (Witkowitz, Austria), describes a tilting furnace in which the vessel containing the bath is mounted in the tilting frame, so that it can be turned, and electrodes pass both through the cover, base, or sides. The tilting frame may be kept stationary, and the hearth and cover rotated in the same or opposite directions at any speed. The centre line of the electrodes is eccentric to that of the hearth. In specification No. 27,147, of 1912, G. Tischenko and H. Plauson (St. Petersburg) claim a process for manufacturing steel or iron in which electrolytically refined iron is melted and pure hydrocarbons in the form of gas or vapour are sucked or forced through the molten mass. In specification No. 27,968, of 1912, G. H. Benjamin (New York) claims a process for refining carbon and phosphorus, which consists in heating the impure iron with excess of lime, in the absence of oxidising substances, in an electric furnace. Carbon is added to the ore with the lime, so that the oxide is completely reduced. All the carbon is removed, together with the phosphorus, by the excess of lime present. To make iron alloys, the refined iron is transferred from the first furnace to one at a lower temperature, where the ingredients are added. Acid or alkali compounds may be added to act as catalysts. In specification No. 2,484, of 1913, Società Anonima Italiana Gio. Ansaldo & Co. (Genoa, Italy) describes a process for treating steel ingots or castings so as to prevent piping. To effect this the ingot or casting is placed within an A.C. solenoid wound in sections, so that the induced currents allow the metal to cool gradually from the bottom to the top, the current in the various sections being gradually switched off. To prepare pure metals or alloys according to specification No. 27,643, of 1913, by A. P. Strohmeier (Westminster), an arc is passed between two or more rods separated by an infusible material to form a slag. The metal of the rods melts and falls into a heated crucible, and the impurities pass off as vapour. It is said that a homogeneous high-grade steel can be thus produced.

**Electrical Mining Fatalities.**—An inquest was held on January 19th into the death of C. W. Walker, a banksman at the Digby Colliery, Nottinghamshire, whose hand appears to have come into contact with an overhead live wire while he was engaged in tipping coal down the screens. The deceased's father is reported to have complained previously about the state of the wire in question. The inquest was adjourned in order that the Home Office might be communicated with, but was resumed on January 27th, when the electrician gave evidence as to the state of the lighting installation. This was arranged for 110 volts, and one of the transformers had apparently failed, so that 500 volts had been found on the line when tested after the accident. He believed that deceased had come in contact with a bare place on the wire. It was stated that the installation was being overhauled, so that there was no connection between the 110-volt lighting circuits and the 500-volt power circuit, and Mr. R. Nelson, H.M. Electrical Inspector of Mines, who was present, was satisfied that the arrangement now made would remove the possibility of any such accident in the future. The jury returned a verdict of accidental death.

The inquest into the death of G. O. Randle at Exhall Colliery, Warwickshire, referred to on p. 4 of ELECTRICAL ENGINEERING of January 1st, has been concluded. The deceased was splicing a cable which was made alive by the boys who were in charge of the haulage motor, owing to some mistake in the signals. The jury returned a verdict of "Accidental Death," and expressed the opinion that the motor boys were not properly instructed, and were not proper persons to be in charge of the switch. They suggested that instructions be given to the electrician to take the handle out of the switch when repairs were being carried out.

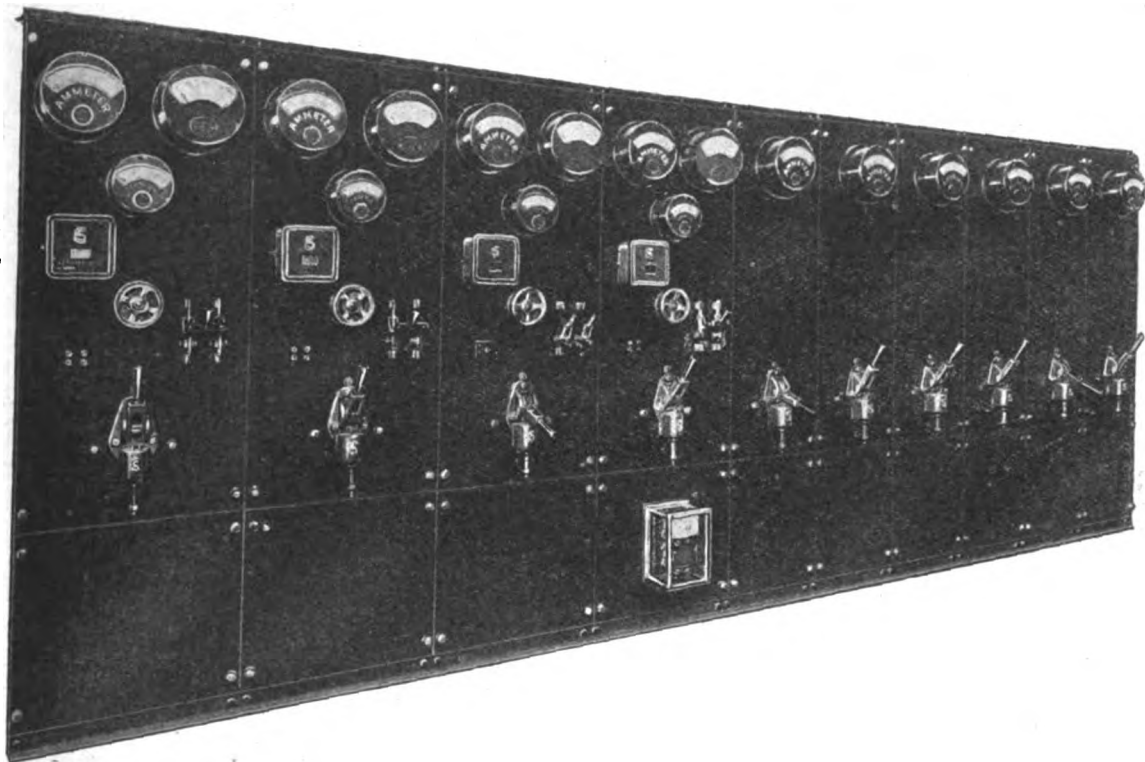
**Association of Mining Electrical Engineers.**—A meeting of the London Branch of the Association of Mining Electrical Engineers will be held on February 6th at the Institution of Electrical Engineers, at 8 o'clock. A Paper will be read on "Electric Safety Lamps" by Mr. F. J. Turquand, and there will be a complete exhibition of various types of lamps now in use. A Paper will also be read by Mr. W. J. Wroe (manager of Tilmanstone Colliery) describing the electrical pumping plant installed at that colliery.

**The Mining Institute of Scotland.**—The second annual dinner of this Institute will be held at the North British Station Hotel, Edinburgh, on February 14th, at 4.45. Tickets, price 6s., can be obtained from Mr. G. L. Kerr, Secretary, 39 Elmbank Crescent, Glasgow.

## A THREE-PHASE SWITCHBOARD FOR ATBASAR COPPER FIELDS

THE Edison & Swan United Electric Light Co., Ltd., have recently designed and constructed a three-phase main

are also used to feed some D.C. power circuits. There are six A.C. feeder circuits and a number of D.C. power and lighting circuits. The generator panels are fitted with "Ediswan" three-phase oil switches, with free operation handles and automatic reverse release. This release is of the inductive relay type, and can be adjusted to operate



"EDISWAN" THREE-PHASE SWITCHBOARD FOR THE ATBASAR COPPER FIELDS.

switchboard for the Atbasar copper fields, to the order of the Power Gas Corporation. The general arrangement of the switchgear is shown in the illustration. The board controls four 250-kw. three-phase 600-volt generators, with two separately driven 750-kw. 100-volt exciters. These exciters

either as a reverse current or reverse power relay, or both. The exciter panels are fitted with "Ediswan" "W" type D.C. circuit breakers for overload only, as it is not intended that these machines shall be run in parallel under normal conditions of working.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 83. —

### THE OSRAM AXIAL LAMP.

THE General Electric Co., Ltd. (87 Queen Victoria Street, E.C.), are putting on the market a special form of Osram drawn-wire lamp, designed to give maximum light in the

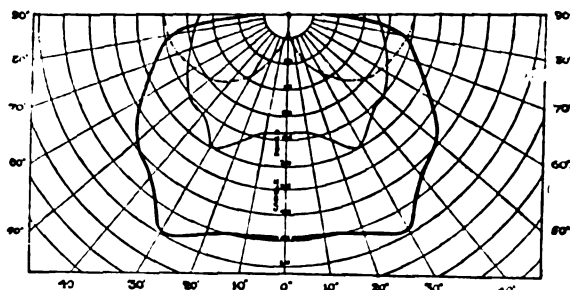
shown in Fig. 2, closely fitting the upper half of the bulb, and held in position by a brass ring. This lamp is, of course, not intended to supersede the ordinary Osram lamp for general lighting, but will be found extremely useful where a strong light is required over a comparatively restricted area.



FIG. 1.—LAMP WITHOUT REFLECTOR.



FIG. 2.—LAMP WITH REFLECTOR.



Curves showing Light Distribution of 30 Watt. 25 c.p. Osram Lamps:—

— Osram Standard Lamp without Reflector.  
— Osram Axial Lamp without Reflector.  
— Osram Axial Lamp with Reflector.

FIG. 3.—LIGHT DISTRIBUTION CURVES.

downward direction. As will be seen from Fig. 1, the filament is almost at right angles to the axis of the lamp. The effect is intensified by the use of an opal reflector, as

and where it is not desirable to use large shades or reflectors, such as over office desks, over special tools in workshops, for billiard-table lighting, for manufacturing jewellers and



watchmakers, for shop-window lighting, and for staircases, corridors, &c. A curve showing the distribution of the light is given in Fig. 3. A 30-watt lamp gives nearly 50 c.p. in the axial direction. The lamps are made in the 30 and 60-watt sizes for both high and low voltage; and as there is only one standard size of bulb, the reflectors are interchangeable.

### THE "DOWNLITE" LAMP

THE Edison & Swan United Electric Light Co., Ltd., are placing on the market a new form of reflector lamp, which is illustrated in Fig. 1. It is made with a separate reflector, which is easily attached and secured by an adjustable sleeve, making it a perfect fit, so that the lamp can be used at

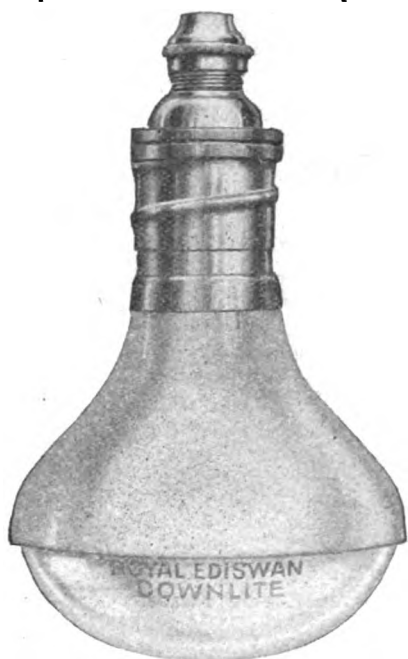


FIG. 1.—EDISWAN "DOWNLITE" LAMP.

any angle, as may be required for concentration of light. The polar curve given in Fig. 2 shows the increased downward candle power (approximately 75 per cent.) obtained with the use of the opal reflector. Whilst this increased light is obtainable just where it is required, there is still a sufficiency of light emitted in the upward direction to give reasonable illumination in all parts of the area to be lighted. This

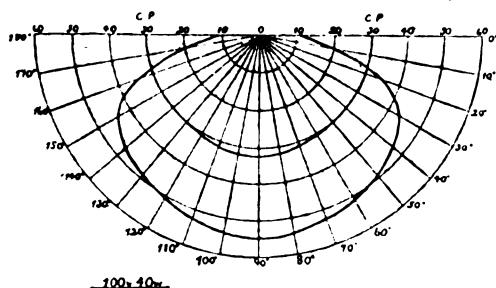


FIG. 2.—CURVE SHOWING DISTRIBUTION OF CANDLE-POWER.

increased downward candle power is partly obtained by the arrangement of the filament, which is in a horizontal plane in one continuous length of grid form, and spirals. The filament is made of drawn tungsten wire, and is well supported to prevent sagging. The Royal Ediswan "Downlite" lamp is especially suitable for interior shop-window lighting, studios, draughtsmen's desks, and offices. It will also be a boon to the householder for its extra downward light for sewing, ironing, reading, &c.

### A "HALF-WATT" LAMP FITTING

IN their price list of Mazda "half-watt" lamps, published on January 12th, the British Thomson-Houston Co., Ltd. (77 Upper Thames Street, E.C.), described six special fittings for these lamps. Since the publication of the above-mentioned price list they have put another semi-indirect "half-watt" fitting on the market. This fitting—the B.T.-H.

"Lumino," illustrated herewith—has been designed to comply with the demand for an inexpensive yet effective semi-indirect unit, which can be used anywhere, independently of the condition, or even existence of a ceiling. The top reflector is made of metal with a white vitreous enamelled reflecting surface, and the under reflector of opalescent glass. The fitting will take a single "half-watt" lamp of any size,



THE B.T.-H. "LUMINO" FITTING FOR "HALF-WATT" LAMPS.

and is supplied complete with Goliath E.S. holder. "Half-watt" lamps in the fitting, which act as excellent distributors and diffusers of the light, are particularly suitable for interior lighting of shops, factories, &c. The brilliance of the "half-watt" lamp renders it necessary that, for interior lighting, it should be screened from sight by fairly dense glassware. The opalescent bottom reflector employed in the B.T.-H. "Lumino" fitting is sufficiently dense to diffuse the light in an agreeable manner, without reducing the efficiency of the unit to any extent.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**G.E.C. PROGRESS SHEETS.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), has again resumed publication of its progress sheets, which was discontinued about three years ago. The first of the new series, as will the subsequent editions, relates to the four-volume catalogue set issued in April, 1912. The progress sheets will be issued quarterly in future, and new bound catalogues about once every three years. In order to admit of ready reference to the progress sheets in conjunction with the bound catalogue set, a reference mark is given at the top of each page or part of a page indicating to which volume and to which section the contents apply, whilst in similar manner the pages are sub-divided and a reference given in each division, showing to which actual page of the bound catalogue set the revisions or additions apply. An important point is that each quarterly progress sheet will contain a revised and complete alphabetical index which will cancel the previous one. Thus it can be seen at once whether any additions or revisions have been made to those in the bound catalogue set, and, if so, reference is also made to the progress sheet. In use, the whole publication may be filed in the binder provided with the bound catalogue set, or else the corrections made in the progress sheets may be carried over on to the bound volumes, and only the additions and the index filed. In addition, the Company is still issuing supplementary publications, such as leaflets, pamphlets, specification sheets, &c., which are of more limited interest, and some of the specialised items are not to be found in the bound catalogues. The system evolved is found to be very convenient.

**WATER HEATERS.**—A leaflet from G. Wilkinson (Beech Mount, Harrogate) gives detailed instructions for connecting up automatic electric water heaters of the "Losles" type.

A METAL wall block calendar bearing a coloured representation of the company's hunting picture, "Sure of a Good Run," has been sent us by Pirelli, Ltd. (144 Queen Victoria Street, E.C.).

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Accrington.**—A loan of £33,500 is to be applied for in connection with new plant.

**Ballyconnell.**—The local electric light and power company invite tenders for horizontal suction gas-engine plant; 180-kw. dynamo, storage battery, switchboard, &c. Secretary, February 14th.

**Croydon.**—Twelve months' supply of house fuse cut-outs, service boxes, meters, &c. Borough Electrical Engineer, February 16th.

**Colne.**—A self-regulating booster is required at an estimated cost of £200.

**Dundalk.**—New generating plant will shortly be required by the Council.

**Eastbourne.**—The alterations to the mains system, referred to in our Local Notes column, will involve the laying of one or two high-pressure feeders from the works to the town, the construction of two new sub-stations, and switchboard extensions.

**Haslingden.**—The following new plant is required:—Mains (£3,700); transformer, switchgear, &c. (£2,000); services (£1,500).

**Hornsey.**—Twelve months' supply of meters, cables, stores, &c. Borough Electrical Engineer, February 23rd.

**Ipswich.**—Paper-insulated cables for continuous-current and A.C. three-phase systems; also disconnecting and service boxes for 4-core L.T. three-phase A.C. supply. Borough Electrical Engineer, February 21st. (See advertisement on another page.)

**Leigh.**—Messrs. Courtauld & Co. are to erect a new silk mill containing 300 electrically-driven looms.

**London: Shoreditch.**—Tenders are invited for E.H.T. and L.T. switchgear. (See advertisement on another page.)

**St. George's-in-the-East.**—10-h.p. motor for the workhouse laundry, Raine Street, E. February 12th.

**Magherafelt (Ireland).**—The Market Trustees invite tenders for an electric lighting plant for the town. The Trustees offer to take shares in the undertaking. Secretary.

**Melbourne.**—20,000-volt and 1,500-volt underground cables and accessories in connection with the electrification of the suburban railways. Consulting Engineers, Messrs. Merz & McLellan, 32 Victoria Street, S.W. March 5th. (See advertisement on another page.)

**Peterborough.**—A loan of £2,850 for electricity works purposes is to be applied for.

**Portuguese West Africa.**—H.M. Consul at Loanda reports a probable market for electrical machinery, &c., in connection with the concession recently granted for electricity supply. The name and address of the concessionaire may be obtained at 73 Basinghall Street, E.C.

**Rhondda.**—Twelve months' supply of meters. Consulting Engineers, R. Hammond & Son, 64 Victoria Street, S.W., February 17th.

**Stockton-on-Tees.**—Twelve months' supply of various stores. Borough Electrical Engineer, February 18th. (See advertisement on another page.)

**Taunton.**—A L.G.B. inquiry was held last week concerning a loan of £4,950 for new generating plant. There was no opposition.

**Wrexham.**—Twelve months' supply of various stores. Borough Electrical Engineer, February 28th. (See advertisement on another page.)

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdare.**—The architect, Mr. T. Roderick, has reported in favour of installing electricity in the industrial school. The plant will include laundry equipment.

**Beckenham.**—New school. Education Committee.

**Blyth.**—New workshops and stores for the Harbour Commissioners.

**Bristol.**—The Corporation has decided to consider the question of substituting electricity for gas in all the elementary schools and other buildings under its control.

**Cork.**—New premises at Buckingham Place, George's Quay,

for T. R. Holland & Co. Architect, J. F. M'Mullen, 30 South Mall, Cork.

**Coventry.**—Artisans' dwellings (£40,000).

**Hounslow.**—New school. Council Surveyor.

**Hull.**—Secondary school for girls, Cottingham Road. City Architect, February 19th.

**London.**—The Metropolitan Water Board is to erect new headquarters in Rosebery Avenue.

**Manchester.**—Rebuilding Golden Cross Hotel, Patricroft.

**Mossley.**—Livingstone Council School.

**Portsmouth.**—Extensions to isolation hospital.

**Rochdale.**—Two new mills are to be erected. Architect, Mr. S. Stott, Oldham.

**St. Austell.**—New infirmary. Architect, E. C. Andrew.

**Stafford.**—Cinematograph theatre. Architects, Nagington & Shennan, 35 Dale Street, Liverpool.

**West Ham.**—Knox Road Special School. Education Committee, 95 The Grove, Stratford, E.

**Worthing.**—Cinematograph theatre.

### Miscellaneous

**Australia.**—The N.S.W. Railways Department requires twenty-four direct-current motor starters. Copies of the specification may be seen at 73 Basinghall Street, E.C.

**Burnley.**—Tramway extensions estimated to cost £26,730, together with twelve cars costing £10,800, are recommended.

**Manchester.**—Twelve months' supply of various stores for Tramways Department. General Manager. February 17th. (See advertisement on another page.)

## TENDERS RECEIVED AND ACCEPTED

**Bolton.**—In connection with the new electricity works, the following tenders have been accepted, subject to the L.G.B.'s sanction to the necessary loans:—Coal-handling plant, weighers' and suction ash-handling plant, Babcock & Wilcox; capstans, Crompton & Co. A tender of the Credenda Conduits Co. has been accepted for a supply of electrical tubes and fittings.

**London: L.C.C.**—In December the Council accepted the tender of T. W. Ratcliff & Co. for electric lighting at the Hammersmith Trade Schol for Girls, at £365 10s. The contractors, however, have been compelled to withdraw, owing to an error, and the Council has accepted the explanation offered. The tender of Messrs. A. Hawkins & Son at £444 has now been accepted for the work.

**Shanghai.**—The General Electric Co., through its Chinese Company, the General Electric Co. of China, has secured for the third time the contract for Osram traction lamps from the Shanghai Tramways (International Settlement).

**York.**—A contract has been placed with Messrs. Chamberlain & Hookham for meters above 10 amperes, prepayment and two-rate meters, and Venner time switches.

## APPOINTMENTS AND PERSONAL NOTES

Mr. H. Hoggart, Installation Inspector in the Blackpool Corporation Electricity Department, is entering the Testing Department of the South Lancashire Power Co. He has been presented with a gold watch by the Blackpool staff.

Mr. J. Dawson, who has been in charge of the Electric Lighting Department of Messrs. J. Blaikie & Sons, of Aberdeen, for sixteen years, has taken up the post of Electrical Engineer to the Duke of Richmond and Gordon, from whose power station the town of Fochabers is supplied.

## THE RECORD ELECTRICAL Co., Ltd.

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The Birmingham Corporation is to be asked to approve, among other increases of salaries of its officials, an increase in that of the City Electrical Engineer, Mr. R. A. Chattock, from £1,200 to £1,500 per annum.

Mr. T. A. Taylor, Mains Superintendent in the Hammer-smith Electricity Department, has obtained a similar appointment at Sunderland. A successor is to be appointed at a salary of £150, rising to £175.

Junior assistant electrical engineer required by an electric supply company in the Far East. (See advertisement on another page.)

Cost and rental clerks are required for a telephone company abroad. (See advertisement on another page.)

Premium pupil is required in the Ipswich Municipal Electric Supply Department. (See advertisement on another page.)

## LOCAL NOTES

**Aberdeen: New Plant.**—A new 3,000-kw. turbo-alternator was started up last week.

**Bexhill: Street Lighting.**—The old arc lamps have now been replaced entirely by pairs of 200-c.p. metal filament lamps on brackets projecting from the original standards, about 6 ft. nearer the ground than the arc lamps.

**Blackrock: Electricity Supply.**—Although the Council has more or less been working in conjunction with the Alliance & Dublin Consumers Gas Co. with regard to the latter's provisional order for this district, it has been decided to lodge a petition against the Bill in order to ensure the insertion of certain agreed clauses with the Company. Judging from a discussion at a special meeting of the Council last week, it would seem that certain provisions in the Bill do not altogether coincide with provisions in the agreement.

**Canada: Electrical Developments.**—The President of the Canadian General Electric Co. recently expressed the opinion that considerable electrical developments may be looked for in Canada, particularly in connection with railway electrification.

**Dundalk: Electricity Accounts.**—The Borough Electrical Engineer in his first report upon the working of the Council's electricity undertaking, states that for the ten months to March 31st, 1913, there was a deficit of £162, after meeting all capital charges.

**Eastbourne: The Electric Supply Failure.**—With reference to the breakdowns on the two high-tension feeders at Christmas time, Mr. J. K. Brydges, the Borough Electrical Engineer, will shortly present to the Electricity Committee a detailed estimate of the cost of making certain alterations to the feeders, distributing mains, and sub-stations, which, in the event of any recurrence of a similar trouble, will considerably reduce the inconvenience. The scheme will consist of dividing up the present system of ring mains into smaller sections, not more than two or three of each being controlled by a separate feeder. As a recognition of the work done by the staff at the time of the breakdown, the Assistant Electrical Engineer and men employed on the job have been presented with small money grants.

**Hebden Bridge: New Plant.**—A 220-kw. crude oil-engine-driven dynamo set, manufactured by Messrs. Willans & Robinson (Phoenix dynamo) has just been put into operation. The total cost was £3,250.

**Holmfirth: Electricity Supply.**—A Local Government Board inquiry was held last week concerning an application for sanction to a loan of £7,500 for the electricity undertaking. When the Council obtained its provisional order last year, the intention was to take a supply in bulk from the Yorkshire Electric Power Co., but the negotiations fell through, and although an effort was made to obtain a supply from the Huddersfield Corporation this also came to nothing. Consequently the Council decided to erect a generating plant of its own, and acting under the advice of Mr. A. B. Mountain, the Borough Electrical Engineer at Huddersfield, a scheme has been drawn up, and a tender by Messrs. T. W. Broadbent & Co. at £4,675 has been provisionally accepted. There was some opposition ostensibly on behalf of the ratepayers, but really, we fancy, on behalf of the Gas Company.

**Ilford: Electricity Tariffs.**—We have been favoured with a copy of the various tariffs of the Electricity Department, which number no less than ten, whilst special rates are quoted for arc lamps and high candle-power lanterns, as

well as for special purposes, such as cinematographs, electric vehicle charging, &c. Lighting tariffs include the rateable value charge of 12½ per cent. per annum and ½d. per unit for all current consumed; a tariff for shops, warehouses, workshops, or business premises, from 8½d. per unit, with a discount according to the quantity taken; a maximum demand rate of 6d. and 1d.; and a prepayment meter rate of 4d. per unit. For power there is the maximum demand rate of 2d. and 1d., or a sliding scale from 2d. to 1d., according to the quantity, whilst for a minimum consumption of 10,000 units per quarter current for power purposes is supplied at 1d. per unit. All current supplied for heating and cooking through a separate meter is charged at 1d.

**Ipswich: Electric Vehicles.**—Mr. F. Ayton, the Borough Electrical Engineer, is doing all he can to push the development of electric vehicles in Ipswich. Following up a general publicity campaign in the town, there has been a demonstration by a 10-cwt. Edison delivery van and a two-seater Edison run-about. These vehicles were in the town from January 21st to January 28th, and as a result there is every anticipation that a number of firms will shortly become purchasers. Whilst the vehicles were in Ipswich, the Electricity Department housed them, supplied energy for charging, and provided attendance and cleaning free of charge.

**London: L.C.C.: County of London Co.'s Bill.**—The London County Council has decided to petition against the Bill of the County of London Electric Supply Co. This does not, however, necessarily mean that the Council is opposed to the principle of the Bill.

**Southampton: Position of Electricity Undertaking.**—After a long debate, the Council negatived a recommendation of the Electricity Committee—carried by the casting vote of the Chairman—that the Borough Treasurer should report upon the financial position of the electricity undertaking. There is a very strong controversy going on in Southampton with regard to the views of the Chairman of the Electricity Committee and Mr. H. F. Street, the Borough Electrical Engineer, as to the wisdom of the financial policy upon which the undertaking is run, especially in relation to the selling of current at 0.5d. per unit. Eventually a resolution was carried by a large majority that the President of the Institute of Chartered Accountants and the President of the I.M.E.A. be each asked to nominate a gentleman to report jointly upon the undertaking.

**Sunderland: Street Lighting.**—The Electricity Committee recommends the Council to reduce the charge for street incandescent lamps from 49s. to 46s. per lamp per annum, thus bringing this form of street lighting on equal terms with the charge made by the Gas Company.

**Wood Green: Electricity Supply.**—The Tottenham District Light, Heat & Power Co., to whom the Wood Green electric lighting Order was transferred last session, is taking active steps to erect its power station. The plans for the buildings are now before the local authority, and orders have been placed for the more important items of plant. It is hoped to be able to give a supply by midsummer.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night was £68 to £68 10s. (Last week, £67 5s. to £67 10s.)

**Dissolution of Partnership.**—The partnership between Frederick Thompson and Hans Ochsenbein, under the style of Thompson & Co., 15 and 16 Garlick Hill, E.C., Electrical and Mechanical Engineers and Commission Agents, has been dissolved as from December 31st, 1913, by mutual consent. Debts will be received and paid by Mr. H. Ochsenbein, who will continue trading at the above address under the title of The General Cable Manufacturing Co., for electric wires and cables, and Jeumont Copper Works, for drawn copper wires, commutator segments, &c. Mr. F. Thompson will trade at 48 Watling Street, E.C., as Thompson & Co., being London agent for Yorkshire Cable Co., Ltd., and British agent for the Rex meters.

**Victoria Falls & Transvaal Power Co.**—An issue of £650,000 5½ per cent. second mortgage debentures, Series B, is being made at 92.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 372 [VOL. X., No. 7]  
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THURSDAY, FEBRUARY 12, 1914.

[PRICE ONE PENNY.  
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## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

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Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE London Central Station employees have decided not to co-operate with the Electrical Trades Union, but have asked the supply undertakings to appoint a Committee to discuss the question of their conditions of working and rates of pay. Steps are already being taken by the Borough Council Engineers to obtain a list of the designations of the various grades of workers and their salaries, and it is therefore not unlikely that effect will be given to this request. The wiremen's wages are being considered by the London Electrical Masters' Association.—The Manchester branch of the Association of Electric Station Engineers is supporting the Weekly Rest Day Bill, and has passed a resolution against the adoption of the Anti-Strike Bill of the North Metropolitan Electric Supply Co. (Page 87.)

WE review the present position with regard to the London Electricity Supply Bill, which will come up for consideration in the present Parliamentary Session. (Page 88.)

THE speeches at the Annual Dinner of the Institution of Electrical Engineers last Thursday were short, and an early adjournment was made for the less formal "reunion" of members. (Page 88.)

A NEW 10,000-h.p. turbo-generator has just been inaugurated in the Neepsend Station of the Sheffield Electric Supply Department, and further extensions are in hand which will accommodate plant aggregating 40,000 to 50,000 kw. (Page 89.)

A PURE fine amorphous variety of tungsten, suitable for the production of ductile tungsten by sintering

under pressure, has been patented by C. Gladitz. (Page 89.)

THE protection of the end windings of electrical machinery from damage due to high initial voltage on switching is discussed in our "Questions and Answers" columns. (Page 90.)

THE use by the Post Office of a device to make an automatic clear for the purpose of eliminating the delay between a telephone subscriber's hanging up and the clearing of the cords by the operator, was among the suggestions made by Mr. W. Aitken in a recent I.E.E. Paper.—Watch and clock makers and others will be pleased to learn that, as a result of Mr. F. Hope-Jones's campaign, the Post Office has abandoned its proposal to charge an annual royalty for the use of apparatus for the reception of international wireless time signals. The fee of one guinea charged for the issue of a licence has, however, still to be paid.—Professor J. A. Fleming's experimental method of producing vibrations in strings is further described. (Page 91.)

A PATENT by A. H. Howard relating to the manufacture of bituminous conduits expires during the week after a full life. The right to the grant of a patent for the cold drawing of tungsten has been surrendered by Pope's Electric Lamp Co. The specifications published by the Patent Office last Thursday include two relating to the "Moore tube" lighting in the name of Moore-Licht A.G., and one by Siemens Bros. & Co. for a method of fusing tungsten in a variety of arc furnace. (Page 92.)

DR. NIETHAMMER suggests that if mercury vapour rectifiers are ever used for traction, they will be of large size and situated in sub-stations supplied with three-phase current.—The purchase price of the Colne and Trawden Light Railway Co. has been fixed at £92,830.—Owing to difficulties in obtaining a supply of power, the Willesden-Earl's Court section of the L. & N.W. Railway will not be working by March 1st, as had been anticipated. (Page 93.)

WE describe in our Trade Section a metal filament lamp for use where concentration of light in the axial direction is desirable, an ingenious automatic apparatus for photographic copying by mercury vapour lamps, and a new ceiling rose combined with switch. A new pattern of electrically driven fan is also illustrated, and further articles deal with a new 150-watt size of metal filament lamp, some fittings for half-watt lamps, an electric heater, and a recent arc lighting installation. (Pages 93 to 96.)

LARGE extension schemes are contemplated at St. Pancras, Rochdale, and Stretford.—Turbo-generators are required at Burton-on-Trent and Nuneaton; mains extensions at West Hartlepool.—Various stores are required by a large number of generating stations.—Three electrically operated coal trucks are required at Southend; and a traction switchboard at Salford. (Page 97.)



THE Edinburgh Electric Light Committee has been advised that it cannot utilise the reserve fund for meeting capital charges.—The possibility of the Brighton Corporation taking over the Hove electric lighting undertaking is again suggested.—The Dublin Electricity Committee is averse from taking off the 10 per cent. increase in prices introduced a year or two ago.—A £6,000 electric bakery has been opened at Burton-on-Trent.—The charges for large power contracts at Kingston have been under criticism. (Page 98.)

THE Yorkshire Electric Power Company's net profit for 1913 was £15,401, against £7,361 in the previous year. (Page 98.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, FEBRUARY 12TH.

*Institution of Electrical Engineers.*

8 p.m. "Some Railway Conditions Governing Electrification," by Roger T. Smith.

FRIDAY, FEBRUARY 13TH.

*Institution of Electrical Engineers: Newcastle Section.*

7 p.m. At Hugh Bell School, Middlesbrough. "Some Notes on Recent Turbine Design," by M. G. S. Swallow.

*Royal Institution.*

9 p.m. Evening Discourse by Prof. J. Norman Collie, F.R.S., on "Production of Neon and Helium by Electric Discharge."

SATURDAY, FEBRUARY 14TH.

*Royal Institution.*

3 p.m. Afternoon Lecture I., on "The Electric Emissivity of Matter," by Dr. J. H. Harker, F.R.S.

*Finsbury Technical College Old Students' Association.*

6.30 p.m. Annual Dance at Caxton Hall, Westminster.

*Institution of Electrical Engineers: Scottish Section.*

7.30 p.m. Annual Smoking Concert at "Grosvenor," Gordon Street, Glasgow.

MONDAY, FEBRUARY 16TH.

*Institution of Electrical Engineers: Western Section.*

5.30 p.m. At Institute of South Wales Engineers, Park Place, Cardiff. "British Practice in the Construction of High Tension Overhead Transmission Lines," by B. Welbourn.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College. "The Design of Static Substations," by W. Dixon.

*Electro-Harmonic Society.*

8 p.m. Concert (Ladies' Night) at Holborn Restaurant.

TUESDAY, FEBRUARY 17TH.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "The Electrical Driving of Rolling Mills," by N. J. Cursetjee.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At 207 Bath Street, Glasgow. "Some Railway Conditions Governing Electrification," by Roger T. Smith.

*Illuminating Engineering Society.*

8 p.m. At Royal Society of Arts. Discussion on "The Lighting of Picture Galleries and Art Studios," to be opened by Prof. Silvanus P. Thompson, F.R.S.

WEDNESDAY, FEBRUARY 18TH.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. "Illumination in Theory and Practice," by W. H. Date.

*"Dynamicals."*

7.30 p.m. Dinner at Trocadero.

### The London Electrical Engineers.

(TO-DAY) THURSDAY, FEB. 12TH.—C. Company. Technical Instruction 7 to 10 p.m.

FRIDAY, FEB. 13TH.—D. Company. Technical Instruction, 7 to 9.30 p.m. Special Instruction on Crossley Engine, 7 to 8 p.m.

SATURDAY, FEB. 14TH.—Headquarters open from 10 a.m. till noon.

MONDAY, FEB. 16TH.—A. Company. Technical Instruction, 7 to 10 p.m.

TUESDAY, FEB. 17TH.—B. Company. Technical Instruction, 7 to 10 p.m.

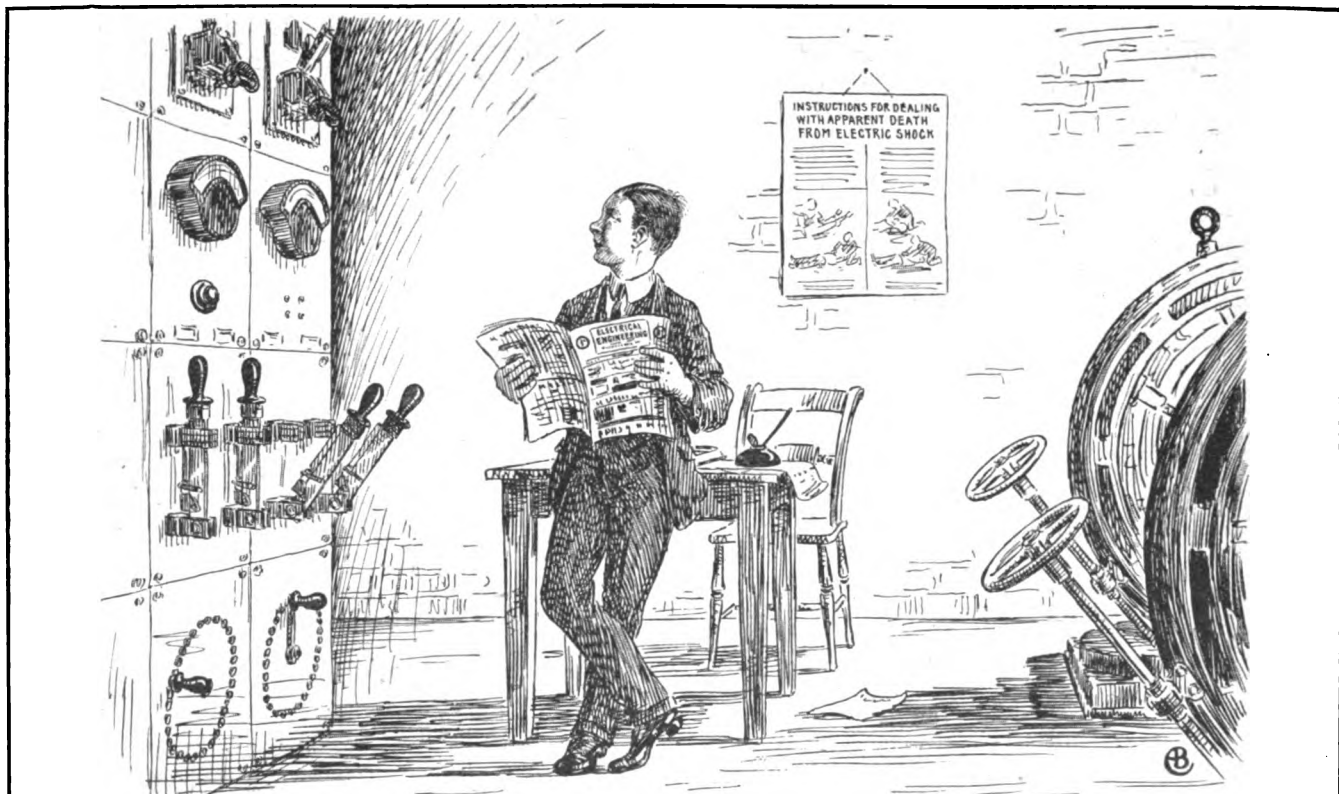
WEDNESDAY, FEB. 18TH.—Recruits only. Infantry Drill and Technical Instruction, 7 to 10 p.m. Rating Examinations are held every Wednesday from 6.30 p.m.

THURSDAY, FEB. 19TH.—C. Company. Technical Instruction, 7 to 10 p.m.

FRIDAY, FEB. 20TH.—D. Company. Technical Instruction, 7 to 10 p.m.

SATURDAY, FEB. 21ST.—Headquarters open from 10 a.m. till 12 noon.

**Steam Consumption Guarantees.**—A note in yesterday's *Times Engineering Supplement* reads as follows:—"Following the comments in this column on the demand of British steam turbine makers for a marginal allowance of 10 per cent. on their consumption guarantee figures before the plant could be rejected, it is understood that for the present it is proposed to revert to the former 2½ per cent. arrangement. This figure is sufficient to cover errors of instruments and other possible uncontrollable variations, and it has the advantage of checking any tendency to speculative guarantees." We have been unable to obtain confirmation of this statement, and have reason to believe that the matter is still under discussion, and that the statement above is not entirely accurate. The allowance of a 2½ per cent. margin for instrument and personal errors in the tests, of course, constitutes no new departure, and this is probably the allowable divergence asked for before penalties can be enforced. It is probable, however, that a further margin—possibly another 2½ per cent.—will be asked for as the minimum allowance before actual rejection of the plant can ensue. In any case, our readers may take it that the 10 per cent. margin before rejection is to be abandoned.



**JUNIOR SUB-STATION ATTENDANT** (reading report of a meeting of the A.E.S.E.):—He maintained that industrial evolution was eliminating the middle class, did he? Well, I shan't join the workmen agitators, so I'll have to be a member of the upper classes.

## THE UNREST AMONG ELECTRICAL WORKERS

### There is no Strike

DESPITE statements which have been published to the contrary, there is at present no strike of electrical wiremen. Wiring work is still suspended in some cases in which the entire work on new buildings has been stopped in consequence of the dispute in the building trade, and, according to a statement made to us by the District Secretary of the Electrical Trades Union, some 28 wiremen have been called off or have stopped worked voluntarily at Lyons' new hotel in Glasshouse Street, and 8 or 10 from the Victoria Hotel, where building alterations are in progress, but these are isolated cases, and there is nothing even remotely resembling a general strike.

The new position of the London Electrical Masters' Association has now been more accurately defined. They concern themselves only with the consumers' side of the main house fuses. Mr. W. R. Rawlings has been elected Chairman in succession to Mr. Horace Bowden, and all the central-station representatives have retired from the Association with the exception of a few who do house-wiring work. The Electrical Trades Union have been informed by the Secretary of the Association that the Committee is now engaged in revising the working rules of the Electrical Contractors' Association, issued in 1912, and that it may be possible to send the Union Secretary a copy of the revised rules by the middle of next week, so that they may be discussed at a suitable date to be fixed later.

### The Central Station Men will not co-operate with the Electrical Trades Union

A meeting of the London Section of the Association of Electrical Station Engineers was held on Wednesday last week. About 40 members were present.

The Secretary gave an explanation of his action in seconding the amended resolution which was passed at the meeting convened by the London Electrical Masters' Association at Caxton Hall on January 27th (see ELECTRICAL ENGINEERING of Jan. 29th, p. 59). He said that the notice inviting the central station employees to appoint delegates to attend this meeting was only posted up at comparatively few central stations, and it had been only possible to get tickets for delegates at Poplar, Fulham, Marylebone, and St. Pancras. The Committee of the Association of Electrical Station Engineers had asked him to oppose the resolution put forward by the employers, but as only five delegates from central stations attended, they could do very little by themselves. He therefore got into touch with Mr. Potter, the London District Secretary of the Electrical Trades Union, and seconded the Union amendment (to refer the matter to the Electrical Trades Union and the Association of Electrical Station Engineers) on the ground that the Association was not adequately represented. This amendment had been accepted by the Secretary of the Masters' Association (Mr. L. G. Tate), and had been passed. On receiving formal notification to this effect from Mr. Tate, he had written to ask him whether the Masters' Association regarded itself as representing the employers of the charge engineers, switchboard attendants, sub-station attendants, and mains' assistants engaged in station work, and in reply had been told that Mr. Tate "speaking unofficially" could not see how his Committee could possibly legislate for the employees employed at stations.

The Committee of the A.E.S.E., the speaker continued, had now decided that the Association could not co-operate or amalgamate with the Electrical Trades Union—but, he added, there was nothing to prevent them from working synchronously and taking the present opportunity to endeavour to obtain an improvement in their salaries and status.

It was proposed and seconded that the Secretary's action be endorsed by the Association, and this was carried without opposition.

The following resolution was next proposed and seconded:—

"Owing to the fact that the London Electrical Masters' Association does not appear to represent the Supply Authorities of London and Greater London, this meeting instructs the London Committee of the A.E.S.E. to circularise all Supply Authorities in London asking them to form a committee to discuss with the A.E.S.E. conditions of working, hours of labour, and rates of pay."

The proposal of this resolution, it was announced, had been agreed to by a large majority of the Committee. In moving the resolution, the Secretary said that the salaries of switchboard attendants varied from 12s. 6d. a week (at Southwark) to £3 10s. with the London County Council, and the pay of mains' assistants from 25s. per week to £300 or £400 per annum. There must, of course, be differences in view of the varying degree of importance and responsibility attaching to the work, but a minimum should at any rate be fixed. It had been suggested that definite "demands" should be put forward, but he was in favour of simply asking for a meeting to discuss the question. The resolution was duly seconded.

The next speaker expressed the decided opinion that the Association was not strong enough to take the action proposed,

and opposed the resolution on the ground that it would for that reason be harmful to the Association to press it.

He was followed by two members who thought that the request was not put forward in strong enough terms. The first of these said that they were not even asking for a rise, but merely asking the employers to discuss the question of a rise; and the second, who took pride in being a Socialist, and was a member both of the Association and the Electrical Trades Union, maintained that to approach the employers in an amicable way would be merely a waste of time. They should, he maintained, drop their notions about status and profession, and recognise that industrial evolution was eliminating the middle class.

Another point was then raised by a member, who said that the Committee must give the members more information, so that they could gauge their strength. What was the percentage of central station employees in London who were members of the Association? One of the previous speakers immediately objected to this information being given, as the Press were present; but it was pointed out that the figures had already been published by ELECTRICAL ENGINEERING (Jan. 29th, p. 59). The total membership, including about 250 applications which were awaiting consideration, was roughly 1,500, and of these over 400 were London members out of a total of about 700 men in London who were eligible for membership.

This gave a new direction to the discussion, and the Socialist speaker said that with this proportion of members they should be prepared to take a more forcible attitude than had been suggested; the E.T.U., who were only organised to the extent of 40 per cent., were ready to come out on strike. He was sure that the employers would not give serious consideration to a request in the terms of the resolution before the meeting, and advocated a more aggressive attitude.

An amendment was thereupon proposed that the Association should co-operate with the Electrical Trades Union. The Chairman explained that this would be contrary to the views of the Committee, and it was further pointed out that a sub-committee had been formed to receive delegates from the E.T.U. to hear their views. The amendment was then withdrawn by the proposer, but the member with the extreme Socialist views insisted on putting forward a similar amendment, which, however, found no seconder.

Another amendment, that the words "some time next week" be added to the resolution, was passed by 20 votes to 16, and when put as a substantive motion was passed by 21 votes to 12.

After the vote, however, it was pointed out that the employers would be certain not to accede to the demand to appoint a Committee to meet representatives of the Association within a week—in fact, in the case of the municipal employers, it would be impossible to do this if the matter would have to go before the Borough Councils. A short discussion ensued, and the resolution was then rescinded, and the following substituted:—

"Owing to the fact that the London Electrical Masters' Association does not appear to represent the supply authorities of London and Greater London, this meeting instructs the London Committee of the A.E.S.E. to circularise all supply authorities asking them to form a Committee to discuss with the A.E.S.E. conditions of working, hours of labour, and rates of pay on March 2nd, or other convenient date."

This was adopted, and the meeting shortly after adjourned.

To give effect to the above resolution, a letter was sent on Monday to all the electricity supply authorities and companies of Greater London requesting them to consider the advisability of forming a committee to discuss with the Association of Electrical Station Engineers conditions of working, hours of labour, and rates of pay of the following grades employed in the generating, transforming, and distribution of electricity, viz., charge engineers, mains engineers and assistants, switchboard attendants, sub-station charge engineers and assistants, and others on the technical staff. The letter, which is temperately worded, explains that the suggestion is made with the hope that early steps will be taken to discuss these matters, indicates March 2nd as a convenient date for this, and concludes with the expression of opinion that much good would result to the electrical supply industry generally if there existed a medium through which all questions between the supply authorities and their employees could be impartially and carefully considered and the various grades defined.

As this letter was only received on Tuesday morning, it has not yet received definite consideration, but we understand that the Hon. Secretary of the Associated Municipal Engineers (Greater London) has replied to it on behalf of the municipal undertakings, saying that it will be placed before the Association at the earliest possible moment. Probably a special meeting will be called at an early date.

In the meantime, the above-mentioned association of Metropolitan Borough Council engineers had already decided that they were competent to deal with the matter, at any rate in the first instance, and a complete list of the designations given to the various grades of employees and the salaries paid is being obtained, so that the whole matter may be considered on a proper basis. The Associated Municipal Engineers (Greater London) are also, we understand, endeavouring to ascertain whether the supply companies desire to act with them and to form a joint committee.

### Meeting in Manchester

A monthly general meeting of the Manchester Branch of the A.E.S.E. was held last Thursday evening at the Merchants' Hotel, Manchester. Mr. Townley, in the Chair, opened the meeting by drawing the attention of the Branch to the proposed Weekly Rest-day Bill which is shortly to be introduced in Parliament. The clauses in the Bill directly affecting station engineers were read. Special attention was called to that regarding circumstances outside human control as being of great importance to the mains engineer when short circuits occurred on his system on Sundays. Another point emphasised by the Chairman was the fact that the Bill made it compulsory that no three Sundays be worked in succession, even in cases of necessity or emergency. This, he pointed out, left no loophole through which the employer could wriggle. He recommended the Branch to advertise the Bill as much as possible, and suggested each member approaching the M.P. for his division, or anyone having influence or authority, and get them interested in its favour. He asked them to put their shoulders to the wheel and push the Bill for all it was worth to make it a success, for it concerned them very much. Additions to the clauses were suggested by members, so that Local Authorities might have no control over their own employees with regard to Sunday work, and also that they should have no power to grant exemption to power companies. A resolution was passed unanimously by the meeting welcoming the Bill, and proposing the insertion of the additions mentioned.

The meeting then went on to discuss a statement that had been circulated to the effect that the London Branch of the A.E.S.E. had thrown in its lot with the Electrical Trades Union concerning the present trouble in London. This statement had caused a great deal of comment amongst the members of the A.E.S.E. throughout the country, and the Secretary in London had received many letters on the question. A letter was read from Mr. Ebben, the London Secretary, denying the accuracy of the statement, and pointing out that such a step could not be taken without first consulting the whole of the members of the Association.

The North Metropolitan Electric Supply Bill (see ELECTRICAL ENGINEERING, Jan. 8, p. 18) was next discussed by the meeting, and the clause giving the authorities power to fine or imprison any employee leaving the authorities' employ knowing that by so doing his action would hinder the working and continuance of the electrical supply, was condemned by many speakers. They said it would restrict the free action of the worker, and described it as panic legislature. A resolution condemning the insertion of such a clause was passed.

The Secretary then proposed that something be done in the way of dealing with the grievances of members with regard to their employment, and generally to try to better the lot of their colleagues. This evoked a lively discussion, and many suggestions of advertising were put forward, but finally it was decided to empower the Local Branch Secretary to circularise members asking them to inform him whether it was their wish that a sub-committee interview their chief regarding any conditions of employment existing in their station.

The next meeting will be held on Thursday, March 5th, when Mr. W. G. Stokes would read a paper on "Electric Driving as applied to Cotton Spinning."

### THE FUTURE OF LONDON'S ELECTRICITY SUPPLY

SINCE the latest proposals for consolidating electricity supply in London were given definite shape in the form of the Bill which will come before Parliament this session (see ELECTRICAL ENGINEERING, December 18th, p. 715, and December 25th, p. 726), many conflicting reports with regard to the history of the Bill and the attitude taken up by the various supply companies in London have been circulated. Some of these reports have had a basis in fact, others were mere surmise, and the majority of them were an intimate blend of the two. Our readers will therefore welcome a statement of what we believe to be the position at present.

Although the Bill stands in the name of the County of London Electric Supply Co., it is more or less an open secret in City circles that the two banking firms, Messrs. Morgan, Grenfell & Co., and T. Henry Schröder & Co., are interested in it, and that Mr. H. F. Parshall is Consulting Engineer to the scheme. All the thirteen London supply companies have been approached, and we understand that, after they had approved the two main principles of the Bill, viz., postponement of the date of purchase of the Companies' undertakings by the London County Council, and bulk supply, a Committee of the Companies' engineers was formed to go into the details of Mr. Parshall's scheme, and to report upon it. The actual scheme is not set forth in the Bill, but briefly the main points are, linking-up, erection of one or more new riverside bulk-supply stations of very large size, and continuance of some of the existing stations only.

Municipal stations are not included, except in so far as that they can take bulk-supply if they want it.

The reports of opposition to the Bill by any of the companies are not accurate. Some of them have filed petitions "against alteration," so as to be represented in the Committee Room, that is all.

The position of the Borough Councils with regard to the Bill is peculiar. Some considerable doubt exists as to whether they will obtain a *locus standi* to oppose the Bill in Committee. A conference of the Borough Council engineers has been held, at which all except Hammersmith, Marylebone, and Hackney were represented. The unanimous feeling of the members, we understand, was that, as the Bill, if passed, would give the London County Council power to extend the life of one or more companies, difficulties might arise with regard to the grant of loans for extensions to various Borough Councils. Such difficulties, it is known, have already arisen in some cases. The Borough Councils represented at the Conference have resolved to oppose the Bill as far as possible, and, if they cannot get a *locus* in Committee, to take steps to have the Bill opposed on second reading. The Conference also viewed with alarm the possibility of the stations of one or two companies being so enlarged that purchase of them at the end of the companies' term would be a commercial impossibility. Considerable dissatisfaction is also felt with the refusal of the London County Council to call a conference of all the Borough Councils. It is known that Mr. C. H. Merz has prepared a report on the whole question for the L.C.C., but the report has not been communicated to the Borough Councils, and they are still in ignorance as to the attitude which the L.C.C. will adopt towards the County of London Co. Bill.

Hammersmith took independent action last month, before the Conference of the Borough Councils was convened. On January 14th a report of the Law and Parliamentary Committee was adopted by the Council, to the effect that steps should be taken to oppose the Bill and to establish a municipal bulk-supply scheme. Some of the other Borough Councils have strongly resented the endeavour on the part of the L.C.C. to curtail the periods of loans for extensions, a matter which Hammersmith does not consider of such importance, and as the two questions are intimately connected, this may account for Hammersmith not having yet acted in unison with the others. It is by no means unlikely, however, that Hammersmith will bring its opposition to the Bill into line with that of the other Borough Councils. Hackney, we believe, is not likely to take any active part in the fight unless its interests are directly affected. Marylebone has petitioned against the Bill on the ground that it does not consider any scheme satisfactory which does not take account of the whole of the electricity supply system of the metropolis, municipal as well as company.

A definite statement of policy by the London County Council would certainly clear the air.

### INSTITUTION ANNUAL DINNER

THE Annual Dinner of the Institution of Electrical Engineers was held at the Hotel Cecil, London, last Thursday. Sir J. Crichton-Browne, F.R.S., proposed the toast of the evening, in the absence of Lord Moulton. He said that medical men always felt a pride in the progress of electricity, and referred to the number of medical men, from Gilbert and Galvani to Helmholtz, who had contributed towards it. Medical men had always recognised the therapeutic value of electricity, and were freely availing themselves of it. They also came in contact with electricity in connection with the inmates of lunatic asylums, as a large proportion of the insane delusions of these patients had now some reference to electricity. He coupled the toast with the name of the President of the Institution, Mr. W. Duddell, F.R.S., "who looks so young, and is so wise." Mr. Duddell briefly responded, and Dr. S. Z. de Ferranti then proposed the guests. Sir George Askwith, K.C.B., K.C., replied, and said that, at the present moment, in spite of there being several strikes in progress, there were actually fewer than there had been for many months past. Even though there might be some "new importations" coming into this country, there was no immediate trouble in prospect. The President announced that the Italian Association of Electrical Engineers had sent greetings to the Institution, and at 10 o'clock the speeches and formal part of the proceedings were concluded. The members then adjourned to the "Reunion" in the adjoining hall, and conversation was carried on until a late hour.

## ELECTRICITY SUPPLY IN SHEFFIELD

A LARGE gathering assembled at the Neepsend Generating Station of the City of Sheffield Electric Supply Department on Monday, at the invitation of the Chairman and members of the Electric Supply Committee, on the occasion of the starting up by the Lord Mayor of Sheffield (Councillor G. E. Branson) of the fine new 10,000 h.p. turbo-alternator which forms the latest addition to the generating plant. The opportunity was taken to inspect the whole station, which has many points of interest, and a good idea was obtained of the rapid rate at which the load is increasing and the large scale on which things are being done in the way of power supply under the guidance of Mr. S. E. Fedden, City Electrical Engineer, from the fact that, in addition to the 8,500-kw. set just put in, which brings the plant capacity up to 21,500 kw., extensions are already in hand to accommodate another 30,000 to 40,000 kw.

The history of electricity supply in Sheffield dates from the pioneering work of a Mr. John Tasker in 1878, whose little supply business was formed into the Sheffield Electric Light and Power Co. in 1892. A station in Sheaf Street was opened in 1894, and this carried on a supply at 2,000 and 100 volts single phase at the time when the city took over the undertaking in 1898. Soon after, however, the system was changed to 2,000-volt two-phase 50 cycles. By 1902, however, the 3,900-kw. of plant which was all there was room for at Sheaf Street, became insufficient, and in 1904 an entirely new station was opened at Neepsend, between the river Don and the Great Central main line, on the same two-phase system. Two 1,500-kw. Parsons turbo-alternators were first put in, followed by a 4,000-kw. Willans-Dick Kerr set. It is interesting to note, however, that before further extensions were made, it was decided that, although two-phase distribution was to be retained, all further plant was to generate at 11,400 volts three-phase, with inter-connection between the two- and three-phase systems by Scott connected transformers. Accordingly, the next set (known as No. 4) was a 6,000-kw. three-phase turbo-alternator, also a Willans-Dick Kerr combination. The generation has thus been successively on the single-, two-, and three-phase systems.

The newest set (No. 5), which we had met to see inaugurated on Monday, is of still larger size, and consists of a 10,500-h.p. "disc and drum" type turbine manufactured by Willans & Robinson, Ltd. (Rugby), driving an 8,500-kw. 11,400-volt three-phase 50-cycle alternator of the standard type, manufactured by Dick, Kerr & Co. (Preston). Both turbine and alternator are similar in general features to the No. 4 set, and are of types of well-tried and proved reliability. The alternator does not rely on any external ventilating plant, but draws in its own air current and expels it through numerous apertures in the casing. A direct-coupled exciter completes the set. This imposing set is mounted on massive foundations at some height above the main engine-room floor, and stands directly over its condensing plant in the usual way. This was also supplied by Willans & Robinson, and employs a three-throw Edwards type air pump on the same shaft as a separate force pump for lifting the discharge from the hot well to the feed storage tanks. These and the circulating pumps are driven by Fuller two-phase induction motors. The condenser is fitted with a vacuum augmentor attachment. Condensing water is taken from and returned to the River Don.

In connection with the E.H.T. three-phase plant, a very fine new switchboard by A. Reyrolle & Co., Ltd., (Hebburn-on-Tyne) has been installed, providing for generators Nos. 4 and 5 and a number of three-phase feeders, &c. The operating panels are vertical, and are placed in a gallery overlooking the latest extension of the engine room, and the actual high-tension gear is of Messrs. Reyrolle's well-known ironclad draw-out pattern, which has proved so successful in some of the large power distribution schemes in the North and elsewhere. The 11,500-volt oil switches are behind the wall, each backing its own control panel, from which it is mechanically operated. There is ample space behind for drawing out the switch carriages for inspection, and the whole strikes one as a remarkably sound engineering job. Synchroscopes of the rotary type are provided, and the voltage regulation is taken care of by a Tirrill regulator.

This new generating set has naturally entailed additions to the boiler plant, and these take the form of two Stirling water-tube boilers of an evaporative capacity of 38,000 lb. per hour. This brings the total number of Stirling boilers up to eight. The first four were of slightly smaller size. Some

are fitted with Bennis, some with chain-grate, and some with underfeed stokers.

In addition to inspecting the old and new plant within the station, we made quite an extensive tour embracing ground that is now being excavated in connection with the further extensions, which, as we have already intimated, will add from 40,000 to 50,000 kw. to the plant capacity. Something like 30,000 cu. ft. of soil is being removed and some of this is of a nature that can be made into bricks to be used on the contract. Part of this space will be occupied by cooling towers, as the limit is already reached, beyond which it is not advisable to rely only on returning the condensing water to the river. Beyond this ground is a large area occupied by open-air coal storage sufficient to accommodate some 15,000 tons of coal, or a six weeks' supply. Care is taken by vertical perforated wood tubes to ventilate the stacks of coal thoroughly, to avoid danger of spontaneous combustion. The coal is taken from the sidings to this storage ground by an electrically-driven overhead ropeway; another ropeway, capable of carrying 20 tons per hour, deals with the ashes, and as the space where these are now tipped, already holding about 40,000 tons, is nearly full, a further ropeway for their disposal in a different direction is to be installed. The existing coal and ash plant is complete and interesting. The coal arrives at the siding at a high level, some is shot direct into the bunkers feeding the automatic stokers, some into a hopper feeding the ropeway to the storage ground, and the trucks are handled by electric capstans, traversers, &c., while electrically-worked hoists are provided for the ashes, all worked by two-phase motors.

Making our return, via the boiler house, to engine-room extensions, where we were most hospitably entertained by the Electric Supply Committee, we admired the long rows of large Stirling boilers with feed-pump rooms at intervals, and noted the completeness of the measuring arrangements, involving Lea recorders and other apparatus. An interesting item of the plant is a high-speed electrically-driven centrifugal pump, which can be used to pump river water into the feed tanks in event of the town water supply failing, to supply river water for fire service in these conditions, and to obtain river water for use in cleaning the boilers.

We obtained an excellent idea of the rapid way in which the undertaking is growing by seeing the large scale on which extensions are being carried out, and when it is said that the units sold per annum have increased nearly tenfold in the last ten years, and have leapt up from 16,902,360 to 21,671,978 in a single year, one cannot doubt the necessity for these heroic measures.

## THE PREPARATION OF TUNGSTEN FOR DRAWN FILAMENTS

THE preparation of what is held to be a new variety of tungsten suitable for compressing and sintering into bars for the manufacture of ductile tungsten lamp filaments is described in a Specification published by the Patent Office on January 29th. The patentee is C. Gladitz, and the patent is No. 27,859, of December 3rd, 1912.

According to the specification, a variety of pure crystalline tungsten (called "fluffy"), having the appearance of an irregular mass of feathers, is produced from tungsten ore, after purification, by grinding to a fine powder, dissolving in caustic soda or ammonia, filtering, and bringing to a specific gravity of about 1.05. This solution is then allowed to drop into boiling hydrochloric acid at a rate between 1,000 c.c. in 780 secs. and 1,000 c.c. in 900 secs. The acid is kept in constant agitation by means of superheated steam led into it. Tungsten oxide is precipitated in fine fluffy flakes without any colloidal formation. It is then decanted, filtered, and washed in hot water, and dried in a nickel drying chamber at a temperature of 450° C. to 500° C. on aluminium trays. It is then sifted through a sieve of 50,000 meshes per sq. in., and a yellow powder having a volume weight of 1.70 to 1.80 results. This oxide is then reduced in a furnace some three metres long, containing a reducing chamber of pure nickel. It is heated by graduated heat units, so that the temperature gradually increases along its length from 20° C. to 850° C. The temperature then rapidly falls, to prevent re-oxidation, and then decreases slowly for the next two metres. The tungsten oxide is passed through the furnace on aluminium trays at the uniform rate of 11 mm. per min. A plastic, deep black, impalpable powder results, which requires less heat than other varieties to effect sintering in a press mould.

**Obituary.**—The death of Professor Karl Pichelmayer, of Vienna, took place on January 23rd, at the age of 45. Prof. Pichelmayer, whose work in alternating-current machine design is well known, had been professor at the Technische Hochschule, Vienna, since 1905, and was Vice-President of the Austrian Elektrotechnische Verein. He was formerly connected with the Vienna house of the Siemens firms.



# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

## QUESTION No. 1,378.

What are the salient features of the magnetite arc lamp, and why does it not find so much favour in this country as in U.S.A.?—"KINK."

(Replies must be received not later than first post, Thursday, February 19th.)

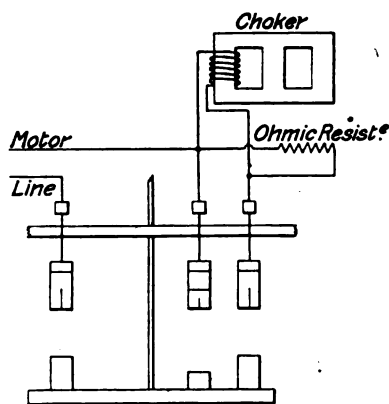


FIG. 1.

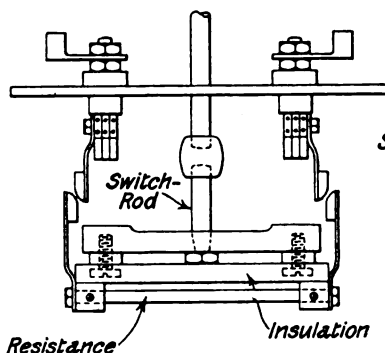


FIG. 2.

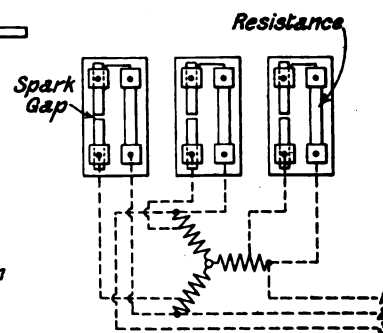


FIG. 3.

## ANSWERS TO No. 1,376.

In high-tension A.C. motors, trouble is often encountered through the insulation breaking down on the coils nearest the terminals, due to the high initial voltage on switching in. Describe fully arrangements which are used, and have been found satisfactory in practice, whereby this trouble can be overcome. "G. T."

The first award (10s.) is given to "J. E. R. R." for the following reply:—

The trouble instanced in this question is brought about by the end turns of each phase acting as a choker to the rest of the phase winding, thus getting the bulk of the shock. The sudden rise of pressure across a comparatively small number of turns causes the voltage between adjacent turns to get abnormally high, resulting in puncturing and consequent short-circuiting and burning out. Where motors are started up by auto-transformers, the latter usually get the shock, and the puncturing appears on their terminal turns instead of those on the motor. The same trouble occurs on the H.T. end turns of static transformers when they are switched on the line. With motors there are three remedies being adopted. First the end turns can be given extra insulation to withstand voltages many times their normal working value. The number of turns to be given this extra insulation usually ranges from 15 to 20 per cent. of the winding. This is also adopted on transformers, but it is a rather expensive expedient, inasmuch as it upsets the symmetry and standard design of the motor or transformer, thereby increasing labour and material costs, and interfering with the ventilation. With auto-transformers, however, this method is feasible and cheap. It is generally the most reliable method,

and becomes imperative on motors and transformers working on very high voltages not only to protect them from switching, but from surges on the line. A second remedy aims at reducing the current by first putting in series an ohmic resistance previous to switching on the line volts. This is automatically accomplished at the switch by fixing an extra contact, which makes a circuit through the resistance previous to the main contact touching, the resistance being then short-circuited, as shown in Fig. 1. This necessitates the fixing of a special switch, as it is not usually possible to fix such a device to existing apparatus. The resistance, of course, has to be very specially insulated, and must be kept separate from the switch. It is usually mounted on porcelain insulators near the switch, but sometimes in a separate oil tank. It can be made capable of adjustment, so that the resistance can be varied to suit the type and power of the motor controlled. This method, however, is not always successful in doing away with the pressure rises unless a comparatively large resistance is put in, and then trouble may arise at the switch. The third, a far more effective method, consists in substituting a choker for the resistance. This has been found to be a cheap and reliable method, and has got rid of many breakdown troubles on H.T.A.C. motors in the writer's experience, especially on pit motors. It is, of course, necessary to fit a choker in each phase, and it is inserted automatically by the switch as shown in Fig. 1. Various designs of chokers are used. Some makers use a coil of copper strip wound in a spiral and mounted on porcelain insulators without iron core. Others use one iron core for all three-phase coils. The ordinary three-limb type of choker is the simplest and most reliable, and as each coil is quite separate, it can be insulated in such a manner as to withstand very abnormal pressure rises. It can be oil immersed if desired, but it must be remembered that its use is only momentary, and quite incapable of much heating. Special

attention must be paid to the insulation of these coils, as it is obvious that they will get exactly the same shock, electrically and mechanically, that the motor coils previously had to meet. Special precautions are needed at the switch so that the length of the blades and contacts allow a short time interval to elapse between first connecting the supply and finally short-circuiting the choker. Mr. Duddell gives the time interval as being 1/10,000 of a second. Quite a special design of switch is needed with three extra contacts brought through the case. It is possible to obtain the same effect by using two switches in duplicate, one to switch in motor with chokers in series, and the other to short-circuit the chokers, the latter being so interlocked with the former that it comes into action a definite time after the first has closed. When using auto-transformers, the whole trouble can be overcome by designing the transformer with specially insulated and rigidly clamped coil. It then forms a starter and choker combined.

The second award (5s.) is given to "J. P. S." who writes as follows.

The information given in the question points to a trouble termed "Front Voltage." It will be found that when this occurs, the breakdown will be between the first few turns at the beginning of each phase, and not to earth. There is also a trouble caused by "Ozone," but this is quite different to the above. There is a tendency to assume that pressures of from 3,000 to 10,000 volts are not dangerous to windings, but this is a mistake, because brush discharges take place between the insulated wires and the mica insulated troughs in the slots, and "Ozone" is produced; this very rapidly destroys the cotton insulation, burns it, and causes short circuits between wire

and wire. The only practical remedy against these defects is to expel the air contained in the winding completely, so that all the wires are embedded in a solid insulator. There is also the inductive action produced by lightning discharges, which are undoubtedly phenomena of high frequency. It has been known that whenever windings have been damaged by atmospheric discharges, it is always at the first few turns at the beginning of the phases that the damage takes place, and that usually the puncture is between turns, and not between wires and frame. This proves that the discharge was unable to penetrate deeply into the winding, and that very considerable potential differences are produced between adjacent wires. This is characteristic of high-frequency effect. From the above it will be seen that one cannot depend upon the cotton insulation which separates the turns, because this insulation is only intended for a few volts. Some manufacturers insulate the first few turns of each phase heavier than the rest of the windings, but there is a limit to this, owing to slot space. The writer believes in making the ends of H.T. stator coils as round as possible, and to avoid sharp corners, because, when a H.T. current is switched on to a wire that has any bends in it, it has a straightening-out effect on the wire. A very effective method is to connect up an "Ohmic" resistance in series with each phase on the oil switch, so that the contacts from the resistance have a lead, thus making and breaking the circuit through the resistance, as shown in Fig. 2. The idea is to cut the pressure down at the instant of switching off and on. Another method is to connect up in shunt to the beginning of each phase and, say, the fourth turn, an adjustable spark-gap and resistance in series, and adjust the gap so that the normal voltage across the turns will not bridge the gap, but the high inductive e.m.f. in switching will. The resistance, being in series, prevents any rush of current. Fig. 3 shows this arrangement.

### ANSWERS TO CORRESPONDENTS

H. P. W.—If you are unwilling to run the machine faster, the only way for you to obtain the somewhat higher voltage desired will be to provide new field windings with more turns. The machine will, however, run hotter, and may not be quite so good from the point of view of sparking.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

It will be interesting to learn whether the "automatic clear," described by Mr. W. Aitken at the Newcastle Section of the Institution of Electrical Engineers last Monday, will be taken up by the Post Office. The device is for the purpose of eliminating the delay which occurs between the subscribers' hanging-up at the close of their conversation and the clearing of the cords by the operator. The relay, which, in the ordinary cord connections, controls the supervisory lamp, is made to control a cut-off relay which disconnects all the connections to the cord when the subscriber hangs up; thus the line lamp is reconnected on to the calling subscriber's line, the line tests idle throughout the multiple, and last, but not least, the junction wire is released. It is doubtful whether the Post Office would adopt this method merely to give subscribers the benefit of having their lines cleared quicker; but if the saving in time between a manual and automatic clear will really conduce to an appreciable gain in the amount of traffic which the junction wires can carry, it may possibly appeal to the Department. A modification of the device for private branch exchanges, which the author described, should certainly have a useful field, if it works out well in practice. Another suggestion made by Mr. Aitken in connection with the automatic clear was that, instead of the supervisory lamps being used as a clearing signal, the connections should be changed so that the converse obtained, i.e., that a glowing lamp should indicate that the cords were in use. This, he points out, would be of great value in assisting the supervisor to observe the operator's load.

We are very pleased to hear that the Post Office has seen fit not to enforce its proposed demand of an annual royalty from users of the "Horphone" and other simple wireless receiving sets adapted for the reception of International wireless time signals. Mr. F. Hope-Jones, who is Chairman of the Wireless Society of London and Managing Director of the Synchronome Co., Ltd., is to be congratulated on the successful result of the arduous fight he has put up on behalf of the National Association of Goldsmiths, the British Horological Institute, the British Science Guild, and others directly interested. The important paragraph in the letter just

received from the Post Office by Mr. Hope-Jones reads: "The Postmaster-General . . . has decided not to require payment of an annual royalty for licences issued in respect of apparatus intended for this purpose [reception of wireless time signals]. The fee of £1 ls., which is charged to cover Office expenses connected with the issue of the licence and the inspection of the installation, will, however, still be payable by applicants for such licences." The earlier stages of the negotiations were dealt with in *ELECTRICAL ENGINEERING* for November 6th, 1913, p. 622, and the *Horphone* was described in *ELECTRICAL ENGINEERING* for July 17th, 1913, p. 421.

The following is a description of the experimental method for the production of vibrations on strings, illustrating the properties of loaded or unloaded telephone cables evolved by Professor J. A. Fleming. It will be remembered the working of the apparatus was shown at the recent exhibition of the Physical Society. The vibrations are produced on a string by attaching one end to the shaft of a small D.C. motor of about  $\frac{1}{2}$  h.p., which has on one end of its shaft a mechanism for counting revolutions, and on the other end a disc which has a crank pin inserted in its outer face, and to this pin is attached a light crankshaft connected at its outer extremity with a rocking lever. The string is fastened to a hook on the crankshaft near to the crank pin. The other end of the string is attached to a fixed point which can be moved by means of a screw, in some cases a spring balance being interposed to measure the tension. When the motor is started the string has a circular motion given to its end which is equivalent to two simple harmonic motions at right angles to each other. If the tension is rightly adjusted the string then vibrates in sections, and the number of sections can be adjusted by altering the tension. The distance from node to node can then easily be measured and the frequency determined from the speed of the motor. In this way the velocity of the wave is measured, and can be compared with the velocity determined by taking the square-root of the quotient of the tension by the linear density of the string. Strings made of flexible cotton cord can be loaded with glass or wooden beads and set in vibration. In this manner it can be shown experimentally that when the wave-length on the string extends over a distance of more than 8 or 10 loads, the string vibrates as if the loading matter were uniformly distributed, but the string cannot propagate vibrations when the half wave-length approaches equality to the distance between two loads. It is also possible to show the reflection of a wave at a load placed at any point on the string, and also that this reflection is reduced by tapering off the loading.

Among the articles in the February issue of the *Marconi-graph* is one dealing with wireless telegraphy in polar exploration, and after a word of regret that Captain Scott was unprovided with any such means of communication, the utility of Dr. Mawson's wireless equipment is referred to; and the fact that Capt. Amundsen is equipping the *Fram* with wireless apparatus, and also providing portable sledge outfits, is mentioned. Illustrations are given of Dr. Mawson's station on Macquarie Island, and at his base in George V. Land, by which the party has been able to keep in touch with the outside world.

The Carcavellos-St. Michael cable was repaired on January 28th, while, on the same date, we have to record the failure of the Zanzibar-Mombasa cable.—The Fort-de-France (Martinique)-Cayenne cable and that between Paramaribo and Cayenne was in working order on the 30th ult.—As from the 1st inst., the rates to Guadeloupe, Martinique, and Marie Galante have been reduced to six francs per word, which equals 4s. 10d. per word.

**Employers and the Trade Disputes Act.**—At a meeting of the Employers' Parliamentary Council held at 25 Victoria Street, Westminster, last week, to consider the grave industrial situation due to the Trade Disputes Act and to the unchecked conspiracy of labour unionism against private freedom and public welfare, arrangements were made to hold a mass meeting of representatives of the Associations of Employers connected with the various industries in the United Kingdom to urge upon the Government the need for an inquiry into the working and the effects of the Act, to determine whether the present unlimited area in which picketing in unlimited numbers may be carried on should not be restricted and the number of pickets regulated by Statute, whether combinations for disorganising trading and social conditions should not be made unlawful, and whether it is not of national interest that all unions should be subjected to the ordinary law of the land, and made responsible, like all other classes, for their actions.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Feb. 5th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

1,069/13. **Loud Speaking Telephone.** R. PECORINI. The instrument is intended for use in vehicles, and comprises a transmitter in a two-part case, enclosing above a contact piece a microphone. This consists of granulated anthracite in a carbon or metal casing, with its edges closed by an asbestos ring. The diaphragm is of carbon. The receiver is also in a two-part case. The bottom part carries a soft iron core and winding of about 0.3 ohms resistance. Five figures.

1,218/13 and 8,712/13. **"Moore Tube" Lighting.** MOORE-LICHT A.-G. To ensure constancy in the light emitted, any impurities in the gas are absorbed or combined chemically by the pulverisation or vapourisation of auxiliary cathodes by the heat of a Geissler tube discharge. According to the second specification, the colour of the light emitted is determined by exciting the tube by superposed currents of particular frequencies. The specifications have four figures and one figure respectively.

10,369/13. **Fusing Tungsten.** SIEMENS BROS. (*Siemens & Halske A.-G.*). The tungsten to be fused is contained in a crucible in an indifferent atmosphere. The crucible has a lining of compressed tungsten. The tungsten to be fused is made the positive pole of an arc furnace, the negative pole also being of tungsten. To prevent bubbles, the tungsten to be fused may have about 1.7 per cent. of thorium added to it.

11,905. **Rotary Converters.** A. H. RAILING and C. C. GARRARD (*G.E. Co.*). The currents which flow in the windings of rotary converters connected to a common A.C. generator or transformer are equalised by means of a differentially wound choke coil. When the currents are equal the device is neutral, but when the balance is upset a P.D. is produced, which tends to restore the current balance. Three figures.

22,018/13. **Reflectors for Advertising Signs.** W. H. G. GWYNN and H. E. CLERK. The reflector is curved, has a clear front surface, then a coloured transparent layer, and behind a reflecting surface. The light is placed so that the angle of incidence of the light from the front of the lamp is less than the angle of total reflection. Four figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SIEMENS DYNAMO WORKS, LYDALL and DUKE [Motor control systems] 1,591/13; BITTER and WEISSBERG [Insulators for H.P. oil-immersed apparatus] 7,656/13; RAILING and GARRARD [Operating rotary converters, &c.] 10,841/13.

**Dynamos, Motors and Transformers:** ROLFE [Turbo-generators] 23,689/12; HIORTH [Induction coils] 22,159/13.

**Ignition:** KETTERING [Starting] 7,543/13; POGNON [Sparking plugs] 28,267/13.

**Incandescent Lamps:** ROUX and SANCHEZ [Filament supports] 1,442/13; KANAZAWA [Filament containing cobalt] 16,481/13.

**Switchgear, Fuses and Fittings:** MIDDLEMISS [Dimmers] 1,467/13; SWAN [Rheostats for motor controllers] 6,226/13; DELVENNE [Automatic motor-starter and brake] 11,135/13; OTIS ELEVATOR Co. (*Otis Elevator Co., U.S.A.*) [Motor controllers] 15,571/13; YOUNG [Fuses] 27,641/13.

**Telephony and Telegraphy:** WESTERN ELEC. Co. (*Western Elec. Co., U.S.A.*) [Telephone exchanges] 1,902/13 and 16,267/13; TORIKATA, YOKOYAMA and KITAMURA [Dischargers for wireless] 1,939/13; DICKINSON [Closing and disinfecting telephone mouthpieces] 2,198/13; BARTON and ROBERT W. BLACKWELL & Co. [Lattice masts for wireless aerials, transmission lines, &c.] 3,829/13; STERRY [Telephone call registers] 7,376/13; Soc. DES TÉLÉGRAPHES MULTIPLEX (SYSTÈME MAGUNNA) [Conversion of direct into isochronous undulatory currents] 14,122/13; TOBIASEN [Masts] 22,639/13; PARRA [Fixing cables and wires to insulators] 26,600/13; BARONIO and WOOD [Tape perforators] 29,389/13.

**Traction:** BLACKALL and JACOBS [Token apparatus] 23,417/12; KENNEDY [Signalling where speed restrictions prevail] 1,964/13.

**Miscellaneous:** WESTERN ELEC. Co. (*Western Elec. Co., U.S.A.*) [Winding machines] 1,617/13; HUNT and LEAKEY [Automatic lock for lift-well gates] 6,963/13; KERSCHBAUM [Metal vapour lamp] 11,991/13; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Stable boron nitride] 12,377/13; BUHLMANN [Illuminated advertisements] 16,474/13; STOCKS [Ship's telegraphs] 21,758/13; A.E.G.

[Discharge tube with incandescent cathode and enclosed vapour forming body] 22,816/13; FRIEDR. KRUPP A.G. [Destroying residual magnetism] 28,715/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** MORRISON [Power transmission] 5,793/13.

**Electrometallurgy and Electrochemistry:** FRIEDR. KRUPP A.G. [Automatic stirrer for electrolytic baths] 742/14.

**Ignition:** NEUFELDT and KUHNKE [Magneto with multipolar rotary field magnet] 12,956/13.

**Incandescent Lamps:** WESTINGHOUSE METALFADEN GLUHLAMPEN-FABRIK, 540/14.

**Instruments and Meters:** HARTMANN & BRAUN A.G. [Simultaneously recording several currents] 27,348/13.

**Storage Batteries:** SVENSKA ÅKKUMULATOR AKTIEBOLAGET JUNGNER [Alkaline accumulator electrodes] 38/14; [Restoring activity of positive electrodes] 72/14; [Manufacture of a mass of the higher oxygen compounds of metal for use in positive electrodes] 1,062/14.

**Switchgear, Fuses and Fittings:** MORRISON [Circuit controller] 5,792/13; FRIEDR. KRUPP A.-G. [Automatic pressure regulators] 28,898/13; A.E.G. [Time switch] 1,176/14; FINCATO [Current regulators] 1,238/14.

**Miscellaneous:** GIRARDELLI [Remote control of guns] 198/14 and 452/14; MASCARINI [Application of the electric properties of metallic sulphides to electro-technics] 590/14.

The following Amended Specification may now be obtained:—

**Telegraphy:** F. JAMIESON [Selective wireless calling up] 19,014/12.

### Opposition to Patent Withdrawn

18,654/12. **Electric Clocks.** C. H. DAVIES. The opposition to the grant on this application has been surrendered. The patent relates to a motor attachment driving a worm gear wheel to drive a spring.

### Right to Grant of Patent Surrendered

22,548/12. **Drawn Tungsten Filaments.** POPE'S ELECTRIC LAMP Co. (*C. Trenzen, Germany*). The right to the grant of a Patent on this application has been surrendered. The specification describes the cold drawing of tungsten alloyed with thorium.

### Application for Restoration of Lapsed Patent

9,537/08. **Conduit Continuity Fittings.** C. VAUGHAN and C. BIRCH (*Jas. Birch & Sons, Walsall*) have made application for the restoration of this Patent, which was allowed to lapse on May 2nd, 1912, owing to the non-payment of the renewal fee. The fittings have sockets cast on, and these are tapped to take a small screw.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

2,964 of Feb. 14th, 1900. **Manufacture of Conduits.** A. H. HOWARD. A wire helix or interlaced wires are placed in a tube or mould together with asphalt or a bituminous composition. The mould is then rotated so that the asphalt is splayed outwards by centrifugal force, and forms with the wires a lining to the mould. When the latter is removed a conduit tube or fitting results.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** H. BECK [Iron rings are placed a little above the arc in converging carbon lamps] 22,511/04; M. RAILING, M. SOLOMON and H. E. CROCKER [Flame arc carbons] 23,116/07.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SIEMENS BROS. (*Siemens & Halske*) [The motor of a winding set is worked from a dynamo driven by several small motors with flywheels] 22,572/03; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Electrolytic lightning arresters] 22,135/08.

**Storage Batteries:** S. LAKE [Submarine equipment] 23,151/02. **Switches, Fuses and Fittings:** HENLEY'S TELEGRAPH WORKS and W. H. NICHOLS [Iron-clad fuse boxes] 21,648/05; E. GAR-SIDE [Motor controllers] 22,228/08.

**Miscellaneous:** J. H. GOEHST [Illuminated signs] 21,293/01; C. A. H. BULLOCK and P. G. E. DANIEL [Machine for supplying postage stamps, &c.] 23,205/07 and 23,251/07.

## ELECTRIC TRACTION NOTES

Some particulars are given in the *A.E.G. Journal* of the locomotives used on the recently opened extensions to the Rhaetian Railway, including the line from St. Moritz to Schuls, and the branch from Samaden to Pontresina. The line, which is of metre gauge, is worked with single-phase current at 10,000-11,000 volts at the contact line, 16 $\frac{2}{3}$  cycles. The locomotive has two fixed and two movable coupling axles and two Bissel bogie trucks. There are two motors, each giving 350 h.p. on the one-hour rating. They drive a shaft through duplicate spur gearing with teeth set at an angle. The gearing shaft drives a jackshaft, situated between the second and third pairs of coupled wheels, through coupling rods set at an angle. The control contactors are operated at 300 volts. Provision is made for taking 100 kw. from the main transformer for heating. Two pantagraph collectors are used. It is said that during the first three months' running 8,500 miles have been covered without any appreciable defects occurring. A train of 180 tons can be started on a gradient of 1 in 40 and attain a speed of 17.4 m.p.h. in 52 secs. The maximum speed attained is 28 m.p.h.

Dr. Niethammer, reporting in *Elektrotechnik u. Maschinenbau* on the progress of electric traction in the United States, writes that the General Electric Co. recently supplied one of the 80-ton direct-current locomotives for the Butte Anaconda Railway with direct-current at 2,400 volts from a 1,000-kw. mercury-vapour rectifier. The rectifier was supplied with three-phase current at 60 cycles, thus giving an almost uniform direct-current. The current from a single-phase rectifier is of a pulsating nature and would necessitate special motor construction. If mercury-vapour rectifiers are ever used for traction work they will probably be large units in substations supplied with three-phase current of any

periodicity, as if placed on the locomotive a double overhead conductor would be required for the three-phase supply.

The Colne Corporation is to take over the Colne & Trawden Light Railway Co., at £92,830. This price has been fixed by Mr. A. J. Ram, K.C., who acted as arbitrator. The Light Railway Co. asked £170,000, whilst the Corporation offered £27,000.

The negotiations for the supply of power to the Earl's Court, Addison Road, and Willesden High Level section of the electrified line of the London & North Western Railway have fallen through. The service which it was hoped to begin on this section by March 1st is not now possible. The Railway Co.'s generating station at Stonebridge Park will, however, be working by the end of the year.

**The Association of Consulting Engineers.**—The inaugural dinner of this Association was held at the Whitehall Club, Princes Street, Westminster, on Monday, February 2nd, with Mr. G. Midgley Taylor in the chair. About 90 members and guests were present. The toast of the Association was proposed by Mr. J. H. Balfour-Browne, K.C., who referred to the useful work that was before them in keeping up the standard of the profession. The chairman, in responding, said that they sought in no way to usurp the functions of other and more technical bodies, but their main object was the better protection both of consulting engineers and of the general public. Mr. H. P. Boulnois proposed the guests, and Mr. C. E. C. Browne, President of the Society of Parliamentary Agents, and Mr. A. Bruce Anderson responded. Mr. J. Swinburne, in proposing the health of the Hon. Secretary and the Hon. Treasurer expressed his appreciation of the work done in the formation of the Society by Mr. Dykes and Mr. Lowcock.

**Transformer Design, Manufacture, and Testing.**—A course of lectures on the design, manufacture, and testing of transformers will be commenced by Mr. F. E. Berry at the City and Guilds (Engineering) College, South Kensington, S.W., on March 5th. For fuller particulars application should be made to the Registrar.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 97. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**HEATING AND COOKING.**—A leaflet has just been issued by Krupka & Jacoby, Ltd. (26 to 36 Chapter Street, Westminster, S.W.), dealing with a make of heating and cooking apparatus for which they are the sole agents in this country. The articles listed include nickel cookers of 1 to 5 pints capacity, warming plates, a range of nickel and brass kettles and tea-pots in various patterns and finishes, flat irons, and a cheap heater for small quantities of water taking only 200 watts. This should prove particularly useful for doctors, dentists, barbers, &c. The irons listed vary in weight from 2 $\frac{1}{2}$  lb. to 8 lb., and may be obtained with different types of handle. One is also provided with a switch, and one of the 2 $\frac{1}{2}$  lb. irons is adapted for running off 100/120 volts or 200/250 volts, and is therefore useful for people who are continually travelling.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**INCANDESCENT LAMPS.**—A catalogue from the Sun Electrical Co., Ltd., deals with Osram, Wotan, Mazda, Ediswan, Auriga, Aegma, Z, Foster, Stearn, and other "conference" makes of tungsten lamps, as well as tantalum, carbon, radiator, tubular, and battery lamps, and special candle lamps, including the "flexalite," "hunalite," "shadoless," and "kingolite" varieties.

**ROLLER BEARINGS.**—The Hoffmann Manufacturing Co., Ltd. (Chelmsford), have now standardised a form of short roller bearing of a type that they have had running with success for over four years, and are issuing a complete descriptive list. These bearings have very high load-carrying capacity for their size, and work which previously called for an excessively large ball bearing can now be dealt with by a roller bearing of practical dimensions. They can run at practically any speed, and are regularly in use on wood-working machinery spindles running at 8,000 to 9,000 r.p.m. For rotary converters, motor

generators, and other electrical machinery, where end thrust is not developed, they should prove invaluable.

**ILLUMINATION.**—An attractive booklet entitled "Industrial Illumination" has just been issued by Siemens Brothers Dynamo Works, Ltd. (Tyssen Street, Dalston, N.E.), containing descriptive particulars and illustrations of various types of material which the firm supply for industrial lighting, including Wotan and tantalum lamps, half-watt lamps, metal and glass reflectors, and several attractive forms of "Alba-lux" and other semi-indirect lighting fittings. A quantity of general information on illumination is given, expressed in a way which should be useful to those contemplating lighting installations. A copy of this booklet will be sent to any of our readers who make application.

**LAMP FITTINGS.**—The latest list to be issued by the Electrical Co., Ltd. (122-4 Charing Cross Road, W.C.), deals with a number of the company's fittings for outdoor semi-indirect and other lighting purposes. Besides robust enamelled iron and other fittings for outdoor lighting generally, including shop-window lighting, a porcelain fitting for chemical factories, &c., is listed. Ceiling and pendant fittings for direct and semi-indirect lighting are available in different designs. The "Goliath" holders and shades for 600- and 1,000-watt lamps occupy a prominent position.

**"MANGANESITE" FOR STEAM JOINTS.**—A little booklet issued by John Hudson and Co.'s Successors (4 Victoria Warehouses, Mansell Street, London, E.) is devoted to a consideration of the application and advantages of "Manganeseite" for making boiler and pipe-work joints steam-tight. The compound or paste may be used even for high pressures and super-heats, and has given satisfaction to British and foreign Government departments, shipping and railway companies, &c. Besides for steam joints, it may be used for water, gas, and air joints. The company will be pleased to send the booklet to anyone interested in this class of work.

**ELECTRIC LIGHT FITTINGS.**—A leaflet from the Edison and Swan United Electric Light Co., Ltd. (Ponder's End, Middlesex), shows some of the new artistic fittings recently produced by it.

A neat, artistic wall calendar has been sent by the Electrical Accessories Supply Stores (9 Queen's Terrace, Miletown, Sheerness).



### THE WOTAN CONCENTRA LAMP

A NEW form of Wotan drawn-wire tungsten lamp of the focussing pattern, giving a maximum illumination in the axial or downward direction, has been put on the market by Siemens Bros. Dynamo Works, Ltd. (Incandescent Lamp and Fittings Department, Tyssen Street, Dalston, N.E.). This is to be known as the Concentra lamp, and will eventually be listed in their general Wotan catalogue. As will be seen

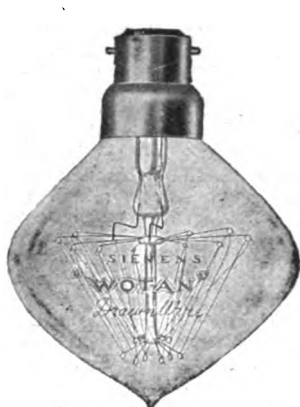


FIG. 1.—CONCENTRA LAMP WITH PLAIN BULB.



FIG. 2.—CONCENTRA LAMP WITH LENS BULB.

from the illustrations, the high illumination below the pip end of the lamp is obtained by the arrangement of the filament conically on a special patented support, the upper portion of which is much wider than the lower. In order to intensify the effect, the lamps are also made with the top half of the bulb opal and the lower half ribbed, as shown in Fig. 2. The distribution of light obtained is shown in Fig. 3, as compared with that of an ordinary

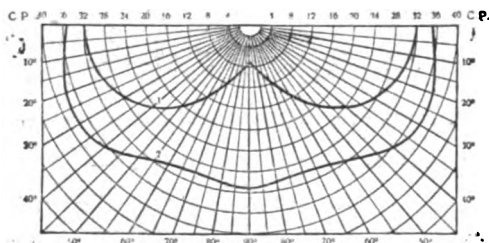


FIG. 3.—CURVES SHOWING DISTRIBUTION OF LIGHT FOR ORDINARY LAMP AND CONCENTRA LAMP WITH OPAL TOP.

Wotan lamp. These lamps are made in the 30, 40, and 60-watt sizes, giving respectively 22, 30, and 48 c.p., with plain or lens bulbs, with or without opal top half, and should be very useful in situations where it is desirable to concentrate the light on to a small surface.

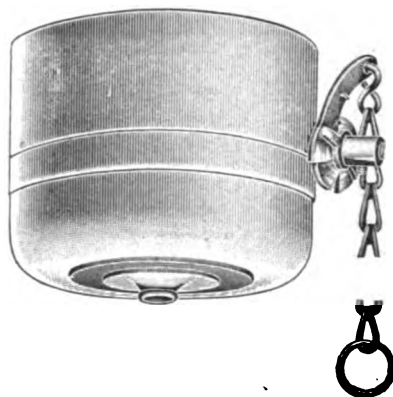
### THE 150-WATT MAZDA LAMP

THE B.T.H. Co. are now listing a new size of Mazda lamp, taking 150 watts, to meet the demand for a lamp intermediate in size between the present 100 and 200-watt lamps. This 150-watt Mazda lamp is made in both 100-130 volt and 200-260 volt ranges, and in either pear-shape (4½ in. diameter, 8 in. overall length), or in round bulb, the same size as the existing 200-watt lamp. The addition of the 150-watt lamp represents a useful extension of the range of Mazda lamps in standard sizes, which has been developed to fulfil the requirements of every lighting condition met with in practice. Readers desiring further information and prices on this new lamp are requested to write to the British Thomson-Houston Co., Ltd., Mazda House, 77 Upper Thames Street, E.C.

**Lundberg Switching Competitions.**—Our readers may remember that in November last a long list of certificate and prize winners in Messrs. Lundberg's Switching Competition of last summer was published in our columns. This list did not include all the Overseas competitors, as a longer time had to be allowed for their papers to reach home. We are informed that the complete list of those who have passed is now as follows:—*Advanced:* W. J. Harris, Royal Engineers' Office, Colombo; H. Keith, Punta Arenas, Chile. *Intermediate:* W. Jude, Antwerp; Drummond Hunter, Wellington, N.Z. *Preliminary:* R. Drilhon, Pau, France; H. H. Morgan, Bermuda; Ardeshir Kaikobai Modi, Bombay.

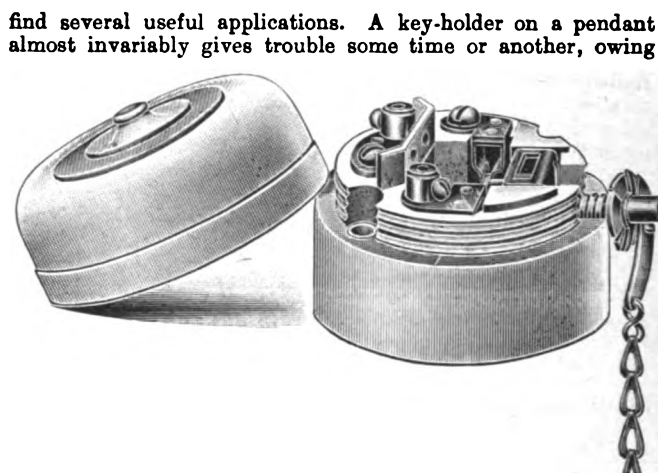
### A SWITCH-CEILING ROSE

THE illustrations below show a new device which has been placed on the market by the General Accessories Co. (70 Worship Street, Finsbury, E.C.). This will doubtless



Two-thirds size.

FIG. 1.—SHOWING SWITCH-CEILING ROSE CLOSED.



Two-thirds size.

FIG. 2.—SHOWING SWITCH-CEILING ROSE OPEN.

find several useful applications. A key-holder on a pendant almost invariably gives trouble some time or another, owing to the baring of the flex and the jerk given to the lamp when the switch is used. There are many cases where this can be displaced by the switch-ceiling rose illustrated.

### THE RECTIGRAPH

WE had the opportunity last week of inspecting the "rectigraph"—a machine for copying drawings and documents by a rapid photographic process with the aid of Cooper-Hewitt lamps. It is made by the Westinghouse Cooper-Hewitt Co., Ltd. (80 York Road, N.). The document to be copied is placed in a frame under a sheet of glass and lighted by means of two 1,000-c.p. lamps placed on independent telescopic stands. It is then photographed direct on to photographic printing paper within a large camera with fixed focus, and adjustable so as either to make a reproduction to even scale or reduced scale; the setting of the paper, developing, and fixing are all carried out automatically, and the operator has only to turn a few handles in the proper order. The whole process takes less than five minutes, and perfect reproductions are obtained. The machine should be particularly useful for making copies of blue and white prints or of other drawings and documents on thick paper for which the ordinary direct photographic printing process is not applicable.

**A "Wotan" Knife.**—Our thanks are due to Siemens Bros. Dynamo Works, Ltd. (Incandescent Lamp and Fittings Department, Tyssen Street, Dalston, N.E.), for an example of the ingenious puzzle pocket-knives which they are distributing as an advertising novelty among electrical engineers and dealers. They have kindly let us into the secret, but we will not divulge to our readers how the knife is opened and closed.

## A HALF-WATT STREET LIGHTING FITTING

A NEW "half-watt" fitting, employing the B.T.-H. radial-wave reflector, has just been designed by the British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.). The radial-wave reflector is made of stamped fluted steel with a reflecting surface of white vitreous enamel. The upper surface is painted green. To accommodate the neck of the Mazda "half-watt" lamp the reflector is fitted with a specially long gallery or housing. The radial-wave reflector fitting can be used with any form of street-lighting post, bracket or cable suspension equipment, and will take any size of Mazda "half-watt" lamp. The characteristics of the radial-wave reflector have been described before, but they



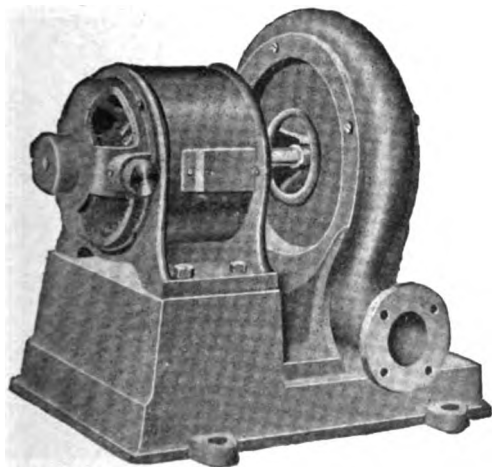
RADIAL-WAVE REFLECTOR FITTING FOR HALF-WATT LAMPS.

may be briefly referred to here. As is well known, the general defect with ordinary reflector equipment for street lighting is that a high intensity of light is given immediately underneath the lamps, while between the posts the illumination is inadequate unless the standards are very closely spaced. This reflector obviates the difficulty by giving a more nearly horizontal direction to the light rays than is possible with a concave reflector. The radial-wave reflector projects the maximum candle-power between the horizontal and an angle of  $80^\circ$  below the horizontal, and thus gives a fairly uniform illumination between the posts when they are correctly spaced. The fittings are supplied complete with special gallery and Goliath E.S. holder.

## FANS AND BLOWERS

WE have received from Simplex Conduits, Ltd. (Garrison Lane, Birmingham), a copy of a new list, which gives particulars of fans and blowers, sewing-machine motors, buffing motors, &c.

The fans cover the usual range of desk, bracket, and port-hole types, having blades from 10 in. to 16 in. in diameter, as well as a range of box blade ventilating fans from 12 in.



SIMPLEX EXHAUST OR BLOWING FAN.

to 6 ft. in diameter, for use in exposed positions. These fans can be fitted with thrust ball-bearings for running with the spindle in vertical position. Motor-generators suitable for accumulator charging, electric blowing, or experimental purposes, are listed in outputs from 50 watts to 250 watts. We illustrate a small self-contained blower for ventilating large rooms, or for the removal of dust, wood shavings, fluff, &c., in factories. These blowers can also be used in smithies.

## ARC LIGHTING IN ST. PANCRAS

THE Borough Council of St. Pancras has recently installed a number of Angold magazine flame lamps in the Euston Road, in place of the old open-type arcs, which had done duty there for so many years. The improvement in the lighting is seen in the two illustrations shown on this page—Fig. 1



FIG. 1.—OLD LIGHTING BY OPEN ARCS.

taken with the old type in use, and Fig. 2 showing the new magazine lamps. In the latter, the excellent diffusion of the light for street-lighting purposes, due to the specially designed globes is very noticeable. The Angold magazine lamps are of 10-amperes capacity, and the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), who were the



FIG. 2.—NEW LIGHTING BY FLAME ARCS.

makers of the new lamp, inform us that whereas the candle-power of the old lamps was about 400 c.p., the new lamps give between 3,000 and 4,000 c.p. with the same expenditure of energy. Similar lamps have also been erected in Tottenham Court Road, Hampstead Road, and Camden Road.

**Mazda House News.**—Under an attractive cover, showing Mazda lamps mounted in Veluria reflectors as church bells against a star-spangled sky, we find the fourth issue of *Mazda House News*, the contents of which, as usual, combine pleasantly the commercial, the humorous, and the technical. The latest information regarding Mazda novelties is given, and there are many excellent illustrations of installations where Mazda lamps are used to their best advantage in combination with the various systems of reflectors in which the company specialises. A special inset deals with Mazda half-watt lamps.

**Central Suspension Lighting.**—Referring to the note on page 71 of our last issue but one, the Electrical Engineering and Equipment Co., Ltd., write that they are also suppliers of central suspension fittings, and that equipments of their manufacture are in extensive use.

## BELLING ELECTRIC FIRES

IN the newest design of Belling fire the radiant bars are arranged on the back surface, which is curved, and in front of the usual aluminium reflector. A ruby lamp is entirely hidden in the scrollwork in front, which is so designed that all the red rays are directed on to the reflecting surface behind the bars, and this light, mingling with that from the glowing elements themselves, presents a particularly cheerful appearance. This design, which, we note, is registered, is known as the "Pedestal."



"PEDESTAL" PATTERN BELLING FIRE.

The switches are conveniently arranged at the top to facilitate easy control. It is 26 in. high and 18 in. wide, and takes 2 kw. on full heat. The finish is in a rich dark bronze. Besides this, the other more popular designs for office and residential heating are listed in a leaflet, arranged for overprinting the names and addresses of supply authorities and contractors, which, together with a small blotting pad, a circular letter, and a large poster illustrating the convenience of Belling fires in the bedroom, are being offered by Belling & Co. (Derby Road, Edmonton, N.) to contractors and supply authorities all over the country. The present time, early spring, is propitious for obtaining converts to electric heating, and among the number of radiators made by Belling & Co. a design suitable for every voltage and position can be found. The capacity of none, except the "Office" pattern, is below 2 kw., so that rapid heating is obtained. There are two degrees of heat, controlled by two switches, on all patterns except the "Office." All the fires in which six heating bars are used can be arranged to take 3 kw. at a slight additional cost. There is, we note, a three years' guarantee in all cases. A useful adjunct to the list is a sheet showing the art porcelain enamel finishes in which the fires can be obtained.

## FIXTURES FOR HALF-WATT LAMPS



"THIRD CITIZEN" HALF-WATT LAMP FITTING.

dozen fittings in which these considerations have been attended to. "Superlux" or "Equilux" glassware is used. The fittings are designed for outside and inside use, and for direct and indirect systems. One of the cheaper fittings, known as the "Third Citizen," is illustrated here, and three other representative examples are shown in the General Electric Co.'s advertisement on another page.

## "P R A N A" DIE CASTINGS

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Write for Leaflet EE 5 to:—

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LONDON, N.

## TUNGSTEN LAMP IMPROVEMENTS

A PAPER by Messrs. W. Harrison and E. J. Edwards, recently read before the American Illuminating Engineering Society, provided a *résumé* of the improvements which have been made in the tungsten lamp since 1908. These relate mainly to increased mechanical strength; better candle-power maintenance, due to the use of chemicals in the bulb; decreased bulb size; and standardisation of lamp dimensions. The introduction of the Mazda drawn-wire lamp in 1911 gave a filament with a strength stated to be 300 per cent. greater than that of the first tungsten lamp. Many people, however, do not realise the extent to which the strength of the drawn-wire filament has been increased since 1911. The British Thomson-Houston Co. tell us that the Mazda filament of to-day is approximately 40 per cent. stronger than in 1911. This is illustrated by the series of transverse tests on filaments made in each year since 1907, plotted as a curve in the figure. The ordinates of this curve are proportional to the distance through which a filament of given dimensions will bend before breaking under the stress of a gradually in-

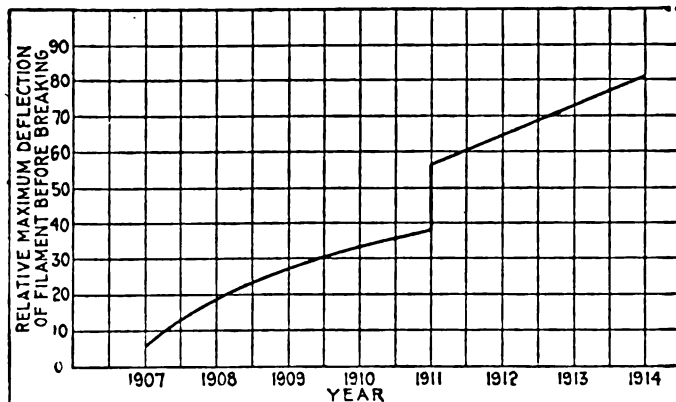


DIAGRAM SHOWING IMPROVEMENT IN STRENGTH OF MAZDA FILAMENTS.

creasing load. The results show that the present Mazda drawn-wire filament can be deflected between ten and twelve times as much as the pressed filament of 1907 without breaking. In the matter of candle-power maintenance there has been great improvement due to the introduction of a chemical into the bulb, which combines with the black deposit and renders it light in colour, thus reducing the bulb absorption to a marked degree. At the present time all lamps above 40-watt size are supplied with the chemical.

Much time and effort have also been devoted towards decreasing the cost of manufacturing and handling the lamps by reducing the bulb size, upon which the cost of reflectors and accessories is also dependent. Mazda drawn-wire lamps have now been completely standardised in a full range of sizes for all lighting purposes. The most important dimension to be standardised from the illuminating engineer's point of view is the distance between the centre of the light source and the base contact of the lamp. The average deviation from the standard in this dimension is less than one fourth of the average a year ago.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Birkenhead.**—Twelve months' supply of meters, fuse-boxes, &c. Borough Electrical Engineer. February 24th.

**Bolton.**—Twelve months' supply of various stores, including motors, motor starting switches, meters, transformers, &c. Borough Electrical Engineer. February 26th. (See advertisement on another page.)

**Bootle.**—Twelve months' supply of cable, meters, fuse-boxes, and terminals, &c. Borough Electrical Engineer, February 18th.

**Burton-on-Trent.**—A new turbo-generator is required.

**Crook.**—An electric lighting scheme is under consideration. It is probable that supply will be obtained from the Newcastle Electric Supply Co.

**Gateshead.**—Additions to Guardians power plant; a 1,600-yard transmission line; 400 lighting points in the Cottage Homes. Consulting Engineers, Tennant & Barrs, Cathedral Buildings, Dean Street, Newcastle-on-Tyne.

**London: Battersca.**—Twelve months' supply of meters, service-joint boxes, carbon and metal filament lamps, &c. Borough Electrical Engineer. March 3rd. (See advertisement on another page.)

**St. Pancras.**—The scheme of extensions outlined in our issue for January 15th, page 40, has been sanctioned by the Council.

**Nuneaton.**—A 600-kw. D.C. turbo-generator, surface condensing plant, &c. Borough Electrical Engineer. February 21st.

**Rochdale.**—Considerable extensions are contemplated at the Electricity Works.

**Salford.**—Main traction switchboard. Borough Electrical Engineer. March 4th.

**Stretford.**—Extensions of plant are being reported upon.

**Walthamstow.**—Twelve months' supply of motors, arc lamp carbons, &c. Borough Electrical Engineer. February 25th.

**West Hartlepool.**—An expenditure of £2,300 is contemplated on mains.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Blackpool.**—Savoy Hydro. Architects, T. G. Lumb, Son & Walton.

**Bolton.**—New mill. Swan Lane Spinning Co.

**Bury.**—Twenty houses.—Electric lighting installation at hospital. Joint Hospital Board.

**Halifax.**—Lighting of West House. Education Committee. Secretary, 22 Union Street. February 16th.

**Newcastle-under-Lyme.**—New free library. Architects, Biggs, Wolstenholme & Thornely, Liverpool.

**Nottingham.**—A new masonic temple, Chaucer Street, Architects, J. & C. E. Howitt, Bentinck Buildings, Wheeler Gate.

**Rochdale.**—Sanatorium. Town Clerk.

**Swansea.**—New cold stores. Harbour Trustees.

**Tottenham.**—Electric lighting of Central Library. March 3rd. Borough Engineer. (See advertisement on another page.)

**Warrington.**—Baths extensions.

### Miscellaneous

**Bacup.**—Arrangements are being made for the electric lighting of the main streets.

**Bury.**—A special sub-committee has been appointed to consider the question of street electric lighting.

**Chilthorn.**—The Parish Council requires fifty-six 50-c.p. electric lamps for street-lighting purposes.

**Crete.**—Particulars of a concession for the construction of electric tramways in Canea are on file at 73 Basinghall Street, E.C.

**Ilford.**—Twelve months' supply of cables, metal filament lamps, joint boxes, switches, meters, arc-lamp carbons, &c. Borough Electrical Engineer. February 24th. (See advertisement on another page.)

**London: Fulham.**—Twelve months' supply of electrical stores. Clerk to Guardians, 129 Fulham Palace Road.

**St. Pancras.**—Arc-lamp carbons. Borough Electrical Engineer, March 2nd. (See advertisement on another page.)

**Nelson.**—A trolley-omnibus scheme is to be installed at an estimated cost of £6,678.

**Salford.**—Two years' supply of stores, &c. General Manager, February 23rd.

**Southend-on-Sea.**—Three electrically operated coal trucks. Borough Electrical Engineer.

**Swansea.**—Progress is being made with the preliminary investigation as to the electrification of the Mumbles railway.

## TENDERS RECEIVED AND ACCEPTED

**London: London and South Western Railway Co.**—An order has been placed with Messrs. Mitchells, Ashworth, Stansfield & Co., of Old Bailey, for 2,500 "Mascolite" felt pads, one inch thick, for resting cables on when passing across bridges, to protect them from vibration.

**Manchester.**—The following tenders have been accepted:—Cables, Johnson & Phillips; Electrical Engineering & Equipment Co.; C. Macintosh & Co.; India Rubber, Gutta Percha & Telegraph Works Co.; Callender's Cable & Construction Co.; W. T. Henley's Telegraph Works Co.; and Western Electric Co. Converting plant, British Westinghouse Co.; three 53-k.v.a. transformers, Ferranti, Ltd.; paper-insulated cables, W. T. Henley's Telegraph Works Co.; tramcar motors, British Westinghouse Co.; controllers, Dick, Kerr & Co.

**Salford.**—The British Westinghouse Co. have been given an order for two rotary-converters and static transformers.

**Swansea.**—Contracts have been placed with the Electric & Ordnance Accessories Co. for motors, and with Brook, Hirst & Co. for starting switches.

## APPOINTMENTS AND PERSONAL NOTES

It is officially announced that Mr. J. E. Taylor, Superintending Engineer in the Post Office Engineering Department, who was reduced in rank in connection with transactions in shares of Marconi's Wireless Telegraph Co., is to be reinstated in his former position at the next vacancy.

As pointed out in our last issue, the Birmingham Electricity Committee recommended that the salary of Mr. R. A. Chattock, the City Electrical Engineer, be increased from £1,200 to £1,500 from January 1st, 1914. When the proposal came before the Council an amendment was moved that the matter be referred back for further consideration. Later, however, another amendment to increase Mr. Chattock's salary from £1,200 to £1,400 was carried by fifty-seven votes to thirty-five.

Mr. H. J. Hawkins, the Salford Borough Electrical Engineer, is to retire in May, and the Committee has fixed the minimum salary for his successor at £1,000 per annum with annual increments.

The many friends of Mr. S. W. Tucker will be pleased to hear that he has now resumed his duties as head of the Order Department of Messrs. Baxter & Caunter, Ltd., after a severe illness. He desires to thank all those friends who made kind inquiries.

Mr. R. B. Leach, at present Electrical Engineer at Heywood (Lancs.), has been appointed Electrical Engineer to the Portrush U.D.C.

Mr. H. J. Penfold has been appointed junior Charge Engineer in the Dover Electricity Department at a commencing salary of £78 per annum.

The Hackney Electricity Committee recommends that the salary of Mr. E. Mathews, Testing Engineer, be increased from £130 to £180 by annual increments of £10; that of Mr. E. Wilkinson, Generating Engineer, from £117 to £127 10s. per annum; and that of the Electrical Draughtsman, Mr. W. Barham, from £180 to £210 per annum by annual increments of £7 10s.

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## LOCAL NOTES

**Aldershot: Electricity Surcharge.**—A short time ago the Local Government Board auditor surcharged a sum of about £15 for expenses incurred by the Borough Electrical Engineer and Chairman of the Electricity Committee in connection with a trip to Belgium to inspect some Diesel engines. The Board, however, has now remitted this surcharge.

**Burton-on-Trent: Electric Bakery.**—The Burton Co-operative Society last week opened some extensions to their electric bakery, which have cost £6,000.

**Chiswick: Electricity Scheme.**—The poll of ratepayers upon the question of whether the Council shall proceed with its Bill for the acquisition of the local electric light undertaking has resulted in an adverse decision, the figures being 950 against the Bill and 416 for the Bill. The number of ratepayers is 8,000, and it will be seen what a very small proportion took the trouble to vote.

**Dover: Bulk Supply.**—Mr. G. F. Metzger, Chief Engineer to the South-East Kent Electric Power Co., has informed the Corporation that it will be necessary for him to complete certain negotiations with the colliery companies in the Dover district before he can quote the Corporation for a bulk supply.

**Dublin: Electricity Supply.**—The net profits from the electricity undertaking for the last financial year were £7,767, compared with £11,870 in the previous twelve months. This falling-off in profits is attributed to the increased price of coal, and the operation of the Shop Hours Act. From time to time requests have been made in the Council that the Electricity Committee should take off the 10 per cent. increase in prices introduced a year or two ago in consequence of the effect of metal filament lamps, but in view of the possibility of even more economical lamps being placed on the market before long the Committee is decidedly against this action. The Committee also urges upon the Council the necessity for building up a reserve fund before profits are transferred to relief of rates. Last year the Council decided to allocate £5,500 to relief of rates against the wish of the Committee, and Counsel's opinion has now been taken to the effect that the Council has no power to do this until the accumulated reserve is sufficient for working capital purposes.

**Eccles: Half-watt Lamps.**—The Electricity Committee has decided to adopt half-watt lamps for street-lighting purposes.

**Edinburgh: Electric Light Surplus.**—We reported in our issue for January 22nd, page 56, that the Town Clerk and City Chamberlain had been asked to report upon the proposition of the Electricity Committee that the reserve fund should be 15 per cent. of the capital expenditure instead of 10 per cent., as at present. This report has now been issued, and it explains that the Corporation's Consulting Engineer has advised that an additional power station will be required within the next few years, the capital expenditure upon which will probably be £125,000. In the years during which the work in connection with this new power station is in progress the ordinary expenditure account of the undertaking will become liable for interest and sinking fund charges in respect of the additional expenditure, and it is in order to be in a position to meet these charges without increasing the present rates for electrical energy that the proposed increase in the reserve fund was suggested. The Town Clerk and City Treasurer, however, point out that under the Corporation's Electric Lighting Order of 1891 the reserve fund is only applicable to meeting deficiencies in revenue where the latter is not equal to the expenditure. In view of this provision they do not think that the proposed increase in the reserve fund could be used for the purpose for which the Committee desire. It is pointed out that the only alternative is to increase the rates of supply; but it is not thought that this would be likely, the opinion being expressed that the natural increase in the revenue of the undertaking will be sufficient to meet the ordinary expenditure, including the extra capital charges during the period up to the date when the expenditure on the new power station becomes remunerative.

**Hove: Electricity Supply.**—The *Sussex Daily News*, for the second time, hints at a strong possibility of an arrangement being come to between the Corporation and the Brighton Corporation for the working of the Hove Electric Supply Undertaking. Our local contemporary suggests that arrangements will be come to in the shape of a "deal" in which Brighton will take over the management of the Hove Electric

Supply undertaking, at the same time agreeing to an abandonment of the through routes of the trolley omnibus system, to which some opposition has been manifested in Hove.

**Kingston-on-Thames: Supply Charges.**—There has been considerable controversy in the Borough with regard to the charges under special contracts for electricity supply. The Works Sub-Committee has now carefully considered this matter at the direction of the Council, and recommends that the existing arrangements and terms be continued. The argument here, as in so many other instances, is that, as these contract prices are something less than the average total cost of production, power is being sold at a loss. This, of course, takes no account of the fact that under these large contracts current is supplied during the hours of non-peak, and that they help very considerably to reduce the standing charges upon the plant which have to be met during this period. An amendment that the matter be again referred back to the Committee was lost by eleven votes to seven, and the Committee's recommendation was eventually carried.

**Redditch: Position of Electricity Undertaking.**—A consulting engineer is to be engaged to report upon the general position of the electricity undertaking.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £68 to £68 10s. (Last week the same.)

**Agency.**—The Victoria Dynamo & Motor Co. (Craven House, Kingsway) have appointed Holmwood Bros., 68 East Street, Bedminster, Bristol, to be their agents for the West of England and South Wales.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Yorkshire Electric Power Co.**—The net profit for the year to Dec. 31st, after meeting mortgage interest, was £15,401, as against £7,361 in the previous twelve months. After including the balance from the previous year and meeting the 6 per cent. preference dividend for 1913, the sum of £5,000 is carried to general reserve, and £4,188 carried forward. The Company's power station at Barugh, where waste gas from coke ovens is used, has given every satisfaction since it was started in October, and there is a considerable increase in the demands in the Barnsley coalfield area. The shareholders are to be asked to approve a further issue of £50,000 six per cent. preference shares.

**Ediswan Smoking Concert.**—The staff and foremen of the Edison and Swan United Electric Light Co., Ltd., Ponder's End, Middlesex, gave their third and last smoking concert of the season on Friday, the 6th, in the Works Café, Ponder's End. There was the usual good attendance of nearly 100 members. Mr. E. P. Barfield presided, supported by Mr. J. E. Cooper, Chief Accountant. Mr. W. Davis, Instrument Foreman, made his usual popular and humorous speech.

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# ELECTRICAL ENGINEERING

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**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 373 [VOL. X., No. 8]  
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THURSDAY, FEBRUARY 19, 1914

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

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Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

FROM a statement made at the meeting of the St. James' and Pall Mall Electric Light Co. on Tuesday, it appears that the supply companies are still far from accepting the scheme for the reorganisation of London's electric supply, put forward in connection with the London Electric Supply Bill. (Page 100.)

THE lighting of covered lawn-tennis courts and squash racquet courts is described in a special article. (Page 101.)

THE latest developments in sparking plugs and ignition systems for petrol engines were described by Mr. H. Procter in a recent Paper read before the Rugby Engineering Society. In a new type of lighting generator, pressure regulation is obtained by a lateral movement of the armature and commutator of special construction under the brush system. (Page 102.)

AN electrolytic process for the conversion of cast-iron into a variety of iron having many of the properties of steel is being developed by a London syndicate. (Page 102.)

THE conditions governing railway electrification in this country at the present time were dealt with in a recent I.E.E. Paper by Mr. Roger T. Smith. He advocated the electrification of suburban lines on any system which might show to the best advantage, and, if necessary, the electrification of the main lines later on, on the same or a different system. Mr. H. W. Firth and Mr. J. B. Sparks expressed disagreement with this course in the discussion. The author thought that there were greater possibilities for the electrifica-

tion of heavy goods and mineral services than for fast passenger services. A separately-excited D.C. motor had advantages of high speed working, as the torque did not fall off so rapidly as with the series motor. (Page 103.)

METHODS of compounding alternators are discussed in our Questions and Answers columns. (Page 104.)

DURING the week there will expire, after a full life, two Patents; one deals with curbing on siphon recorders, and is by A. Muirhead, and the other relates to a Westinghouse adjustable electromagnetic track brake. Bertram Thomas seeks restoration of some lapsed patents relating to switchgear, and, it is announced, the Comptroller has allowed the grant of a patent to C. H. Fischer for the manufacture of tungsten suitable for drawn metal filaments. The grant was opposed. Abstracts of patent specifications published by the Patent Office last week are also given in our "Patent Record." (Page 106.)

In a recent Paper on portable wireless telegraph sets for army and aerial work, &c., Mr. P. R. Coursey gave some information as to new sets and systems. A set devised by Mr. Dubilier gives a range of 30 to 40 miles with an expenditure of 75 to 100 watts. A musical note is obtained by regular condenser discharges controlled by a novel system of vibrating contacts.—Inspectors of steamships in American ports have found that, in some cases, the emergency wireless equipment has not been kept in good repair. (Page 105.)

ILLUSTRATED articles in our trade section describe a star-delta drum type starter, new forms of automobile and battery lamps, fittings for half-watt lamps for indirect lighting, and a half-watt lamp installation, new sizes of half-watt lamps that are being introduced are also mentioned. (Pages 107 and 108.)

THE Great Eastern Railway Co. is probably seriously considering the difficult problem of the electrification of its large suburban system, and the experience of the newly-appointed General Manager from the Long Island Railroad, New York, will be valuable in this connection.—A scale drawing of the two sizes of battery charging plug adopted by the Electric Vehicle Association of America is given. (Page 105.)

THE Dundee Corporation complains of what it terms the manufacturers' "combine" prices, and has authorised its Engineer to negotiate privately for new plant.—The Lowestoft Electric Light Committee has decided to instal arc lamps for certain public lighting, instead of half-watt lamps.—The offer to purchase the Stirling electricity undertaking has not met with the approval of the Corporation.—The Hove Corporation has taken up a loan of £180,000 for the purchase of the local electric supply company. (Page 110.)

A 500 kw. turbo-alternator, &c., is required at Bexley; A.C. plant at Dartford; transformers and switchgear at Aberdare; a 1,000 kw. converter at Aberdeen;

distributor cables at Barnes; and a rotary converter, &c., at Southampton.—Loans are to be taken up as follows:—Ipswich (£28,000); Kettering (£12,000); Rhyl (£3,900); Warrington (£14,550).—Electrical stores are required by a large number of municipalities. (Page 108.)

A DIVIDEND of 10 per cent. and a bonus of 5 per cent. is declared by Mather and Platt, and a dividend of 15 per cent. and a bonus of 5s. per share is declared by W. T. Henley's Telegraph Works Co. for 1913.—The proposal of the Yorkshire Electric Power Co. to distribute electricity in districts where there are no provisional orders, does not interfere with the rights of the local authorities to apply for electric lighting orders also. (Page 110.)

## ARRANGEMENTS FOR THE WEEK

### FRIDAY, FEBRUARY 20TH.

*Institution of Electrical Engineers: Yorkshire Section.*  
6.30 for 6.45 p.m. Annual dinner at Hotel Metropole, Leeds.

### SATURDAY, FEBRUARY 21ST.

*Royal Institution.*

3 p.m. Afternoon Lecture II.:—"The Electric Emission of Light," by Dr. J. A. Harker.

*Birmingham and District Electric Club.*

6.30 p.m. Annual dinner at Swan Hotel, New Street.

### MONDAY, FEBRUARY 23RD.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College, Newcastle. "Some Railway Conditions governing Electrification," by Roger T. Smith.

### TUESDAY, FEBRUARY 24TH.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At University, "Some Railway Conditions governing Electrification," by Roger T. Smith.

*Institution of Civil Engineers.*

8 p.m. "Rail Steels for Electric Railways," by W. Willox, and "Rail Corrugation and its Causes," by S. C. Sellon.

### WEDNESDAY, FEBRUARY 25TH.

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At University. "Electric Locomotives," by F. Lydall.

### THURSDAY, FEBRUARY 26TH.

*Institution of Electrical Engineers.*

8 p.m. "Motor and Control Equipments for Electric Locomotives," by F. Lydall. The same author's Paper read at Birmingham on Wednesday, February 25th, will also be discussed.

### FRIDAY, FEBRUARY 27TH.

*Institution of Electrical Engineers: Manchester Section.*

7 to 7.15 p.m. Annual Dinner at Midland Hotel.

## The London Electrical Engineers.

*Rating Exam.* for all Co.'s.—7—10 p.m. every Wednesday.

(To-Day) THURSDAY, FEB. 19TH.—C. Co. Tech. Inst., 7 to 10 p.m.

FRIDAY, FEB. 20TH.—D. Co. Tech. Inst., 7 to 10 p.m.

SATURDAY, FEB. 21ST.—Headquarters open 10 a.m. till noon.

MONDAY, FEB. 23RD.—A. Co. Tech. Inst., 7 to 10 p.m. Min. Range Practice, 7 to 9 p.m.

TUESDAY, FEB. 24TH.—B. Co. Tech. Inst., 7 to 10 p.m. Min. Range Practice, 7 to 9 p.m.

WEDNESDAY, FEB. 25TH.—Recruits.—Infantry Drill, 7 to 8 p.m. Tech. Inst., 8 to 10 p.m.

**The Institution Lending Library.**—The Institution of Electrical Engineers has issued a catalogue of 637 books constituting its Lending Library. The Library is open to all classes of members, including students, any of whom may borrow single volumes for fourteen days at a time without fee, and books will be sent by post on application to the Secretary. The list covers a wide field, and a useful feature is that the date of publication is added after each book. Books are listed under the names of the authors, arranged alphabetically, and the addition of a subject index would be an improvement. We regret to see that, presumably by inadvertence, some books which are dedicated to amateurs and describe practice that would not be recognised as correct by the Institution itself, are included. In order to avoid disappointment to members applying for books personally, it should be added that the works in the catalogue are not all in the Lending Library at present, but will be purchased as they are applied for.

## THE LONDON ELECTRIC SUPPLY BILL

SOME particulars with regard to this Bill, obtained from authoritative sources, were published in our last issue. In this connection considerable interest attaches to a statement made by Mr. Walter Leaf, Chairman of the St. James's & Pall Mall Electric Light Co., Ltd., at the Company's general meeting on Tuesday. Mr. Leaf said that his Company had no part in the inception or drafting of the Bill, and heard of it first only through the public advertisement. They would, of course, be glad to have an extension of life beyond the forty-two years given in their Order, but it was essential that they should have a voice in the terms upon which that extension was to be obtained. They had, therefore, deemed it necessary to join with other companies in presenting a petition against the Bill. The Company had been approached by the financial group which desires through the medium of the Bill to effect under the form of a large holding company an amalgamation of all the electric supply companies of London. This scheme was still under consideration by a Conference, and he had no right to anticipate their decision. He could only say that the St. James's Company were not yet satisfied that the scheme would effect the economies and secure the profits which it promised, and they were awaiting further information. The proposal in its present form, he added, would be unacceptable to the St. James's Company, as it failed to recognise the exceptionally strong position which the Company, with others, had attained by prudent and conservative management in the past. As soon as any scheme was presented which was satisfactory to them, they would lose no time in calling a meeting of the Company and laying it before them.

In view of the above statement with regard to the form of the supply companies' opposition to the Bill, which is some what in conflict with a statement from another source made last week, which we felt bound to accept, we have ourselves taken steps to ascertain the true facts of the case. We are able to confirm and to add to Mr. Leaf's announcement above. The following supply companies have definitely petitioned against the Bill:—The Charing Cross Co., the Brompton and Kensington Co. and others (evidently the joint petition referred to, which probably includes the St. James', Westminster and Central Electric, and the Kensington & Knightsbridge and Notting Hill Companies), the London Electric Supply Corporation, the South Metropolitan Co., the City of London Co., and the Metropolitan Electric Supply Co. The London County Council, Corporation of the City of London, and the Marylebone, Hammersmith and Woolwich Councils have also lodged petitions against the Bill up to the present.

The Bill will be taken in the House of Commons first.

**Safety Precautions for Machinery.**—A report by Mr. W. Sydney Smith, H.M. Inspector for dangerous trades, on fencing and safety precautions for transmission machinery, has been issued by the Home Office with the object of explaining the safeguards, structural and administrative, which the experience of the Department shows to be needed for the protection of persons employed. It is pointed out that certain of them are not adequately covered by the existing law relating to mill gearing, and it is proposed that the more important requirements should be embodied in new regulations under Section 79 of the Factory and Workshop Act, 1901. The proposed regulations are given as an appendix to the report (which can be purchased for 6d.), but the formal issue in draft is deferred until occupiers and others concerned have had time to consider the proposals and to submit any observations that they may desire to offer at this stage. The report is fully illustrated, and contains many useful suggestions as to the treatment of couplings, shafting, projecting key heads, belting, &c.

**Interruption of Supply over Ontario Hydro-Electric System.**—On January 31st the supply over about 420 miles of high- and 20,000 miles of low-pressure lines throughout the Niagara district was interrupted for about eight hours. The district affected extended from Niagara Falls, Ontario, to Toronto on the north, and to London and St. Thomas in the west. According to the *Electrical World* (New York), the lines were encased in ice, owing to a sleet storm, when a local hurricane swept across the transmission line between Niagara Falls and Dundas in a straight narrow streak at right angles to the line.

**The Junior Institution of Engineers.**—A Local Section of the Junior Institution of Engineers is to be formed with Sheffield as its centre. The inaugural meeting will be held at the Cutlers' Hall, Sheffield, at 8 p.m., when the Chairman of the Institution, Mr. Ernest King, will occupy the chair. The local Hon. Secretary, *pro tem.*, is Mr. R. J. Stanley (Rose Bank, Totley Brook Road, Dore, near Sheffield). Among the immediate future arrangements we note that there is to be a visit to the Kingston Electricity Works on February 21st. The annual dinner is to take place at the Holborn Restaurant on February 28th. The subject for discussion at the "informal meeting" on February 27th, is "The Operation and Upkeep of Electric Motors," by Mr. E. F. Butler. These meetings are held every Friday at 8 o'clock, at the offices of the Institution. Those who would like fuller information as to the activities of the Junior Institution of Engineers, should write to the Secretary, Mr. A. Clifford Swales (39 Victoria Street, Westminster, S.W.)

## THE LIGHTING OF COVERED TENNIS AND SQUASH RACQUET COURTS

THE satisfactory artificial illumination of covered lawn-tennis courts is a subject presenting peculiar problems: but the successful way in which these have been surmounted in the few electrically lighted courts that have already been established is giving quite an impetus to the construction of covered courts for playing on after dark. Not only have the lights to be arranged so as not to dazzle the eyes of the

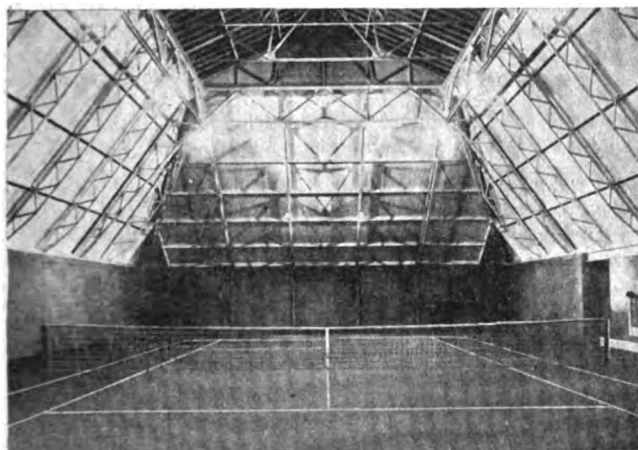


FIG. 1.—ELECTRICALLY-LIGHTED COVERED TENNIS COURT AT LIVERPOOL.

players in any part of the court, but there must be bright, uniform, and glareless illumination. An illumination of about 2.5 candle-feet at a distance of 3 ft. from the floor is ample if uniform all over the court, but a little extra light may be provided over the service lines.

We believe that the first artificially lighted lawn-tennis court in this country was that established at Dulwich, where experiments were made with high-pressure gas lighting with overhead lamps all over the courts, and an elaborate compressor outfit driven by a gas engine. The installation as at first carried out was unsatisfactory, and was afterwards remodelled on the advice of Mr. H. M. Rootham, of Craven House, Kingsway, who specialises in covered-court construction and lighting, with lamps in reflectors at the sides, on the same lines as the electrically lighted courts described below. We are told that the total cost of this lighting worked out, including the maintenance of mantles, compressors, &c., at about 1s. 2d. per hour. In further courts for which Mr. Rootham has been responsible electric lighting has been used. The next court to be constructed was one for the Liverpool Racket Club, at Upper Parliament Street, Liverpool. This is a single court, 119 ft. by 56 ft., with a specially designed light steelwork roof, as seen in Fig. 1. The top is glass for day-light illumination, and the sloping sides of the roof are whitewashed, and, acting as reflectors and diffusers, play an important part in the scheme of artificial illumination. The short vertical walls are coloured with a restful green, and the soft deal floor, as at Dulwich, is treated with a special preparation giving a perfectly dead matt black, showing no shadows and incidentally giving excellent foothold. Turning now to the actual lighting, we have at each side, 28 ft. from the floor, four 1,000-c.p. Osram lamps in special reflectors of truncated pyramid form lined with Chappuis ribbed silvered glass, and provided with extra "blinkers" at the side to shield the players' eyes from the filaments. A large part of the light from these falls on the sloping white surfaces opposite them, from which it is reflected down. No direct light can reach the players' eyes near the ends of courts, and in the more central part of the court the lamps can only be seen by looking up at unnatural angles not reached during play. In addition to the main side lamps, there are a pair of 200-c.p. Osram lamps suspended at each end just behind the service lines, well hooded by Chappuis reflectors. These are of use to the server in seeing

his ball specially clearly, and also to the other side in observing his movements well. It will be noted that the current-consumption is just 10 kw. and as a special rate of 2½d. per unit is charged, the cost of current works out at 2s. 1d. per hour. Actually 3s. 9d. is charged to the players for illumination for 1½ hours' use of the court. In this particular club this figure was not objected to, in consideration of the capital cost of the installation being very much below that of a high-pressure gas equipment, but in future cases it is to be hoped that half-watt lamps will be used, enabling electric lighting to beat gas on the question of price as well as all its other manifold advantages. A number of crack players who have had experience of the various lighted courts on the Continent, including the King of Sweden's court, which was the first to be established, declare that the lighting at Liverpool surpasses anything that has been done yet. In one case, as it got dark the lights were gradually switched on one by one, and at the end of the game the players expressed surprise when they found that they were playing entirely by artificial light.

Following the success of the Liverpool court, the matter was taken up by the Dublin Covered Court Club, and two courts were constructed at Ballsbridge. Although for local reasons a system of gas lighting was adopted, lights were arranged in a similar way as at Liverpool with slight modifications, owing to the different style of construction of the roof. Owing to the absence of inclined surfaces, canvas screens are used to diffuse the light. The floor in this case is a special dark brown, as favoured in Germany and used at Bremen and elsewhere; but this is not quite so shadowless as the dead black already referred to. The walls are dark green. Two lighted covered courts are about to be constructed on the same principles at Copenhagen, and the matter is under consideration at Manchester, where three courts are projected, and at Birmingham. In these courts it is probable that half-watt lamps will be employed, as the size of unit employed is eminently suited to their use; but in the cases where the supply voltage is in the neighbourhood of 200 volts, they will, at first, at any rate, have to be grouped in pairs of two in series.

The lighting of squash racquet courts, which are now becoming so popular, is a different and a simpler problem. The great difference is that the floor and walls all round are white, while the ball is dark. It is only lately that the size of these courts has been standardised by the Tennis, Racquets, and Fives Association at 30 ft. long by 21 ft. wide, with 14 ft. clear height. Unfortunately many existing courts, including the famous squash courts of the Royal Automobile Club, are of other dimensions. For lighting a standard court, five 100-c.p. lamps are ample, and in most recently constructed courts each lamp is mounted in a holophane bowl fitting, giving excellent distribution. The lights are all overhead, with four equally spaced and the fifth used to reinforce the illumination on the front wall. This system is used at the new courts at the Adelphi Hotel, Liverpool, two at the Royal Artillery Mess, Woolwich, one at Chislehurst



Exterior.



Interior.

FIG. 2.—ILLUSTRATIONS OF A MODERN FORM OF SQUASH RACKET COURT.

Golf Club, as well as many private courts. A typical court is illustrated in Fig. 2. Mr. Rootham, to whom our thanks are due for the above information, was responsible for the construction of all the tennis and squash courts mentioned in this article, and informs us that he has put up twenty-four squash courts in the last eighteen months, and has something like a further forty coming on. It may be mentioned that he uses a special cement construction which ensures non-sweating walls that can be treated to give a very high degree of reflection.



## ELECTRICAL ACCESSORIES FOR AUTOMOBILES

A PAPER with this title was read by Mr. H. Procter before the Rugby Engineering Society on Tuesday, February 10th. The author commenced by tracing the progress of electrical ignition from the low-tension system to the high-tension and "dual" systems of the present day. In the double-pole system, using a single magneto, a plug with two insulated poles was connected in series with one of the ordinary type. By this arrangement the likelihood of engine stoppage through short-circuiting of the spark-gap by carbonised oil was lessened, and, in the event of this happening to one plug, the short-circuiting substance was immediately burned off. In many cases the latter effect was secured by placing an external spark-gap in series with an ordinary plug. These devices, however, practically doubled the stress on the insulation of the magneto. Special magnetos had been made to operate a double set of plugs, and, to get the engine to start without cranking and without batteries, a small magneto had been devised which, when rotated by hand, discharged across all the spark-gaps, connected for the time being in series. In order to obtain satisfactory spark discharge at low values of engine speed, and thus facilitate starting, plugs having variable gaps were introduced, and in one case the different rates of expansion with increase of temperature of dissimilar metals had been used to effect this automatically. When cold the central electrode was curved towards one of the three outer ones and the gap thus shortened, while, when running at maximum temperature, the distances between it and the three outer electrodes were approximately equal.

The various types of car-lighting systems with and without engine self-starting arrangements, were described. In a type of machine recently introduced from France, the armature moves endwise on its shaft against the pressure of a spring when its speed and current output increase. This motion is produced by pins, fitted with rollers, working in spiral grooves in the bore of the armature spider. In addition to the ordinary commutator, there is a second one with an equal number of segments, but set at such an angle to it that it leads the former by about five segments. These commutators are connected together by a spirally arranged set of connecting bars, in the form of a third commutator. This is separated from the main commutator by a ring of insulating material on its surface, the arrangement of these portions being, commencing at the armature: main commutator, insulating ring, spiral and exciting commutators. At standstill position the main brushes rest on the insulating ring, and the cut-out is thus formed. A third brush, the current from which is used for excitation, presses at the same time upon the exciting commutator, the angular displacement of this producing rapid excitation of the field magnets. As the speed increases the main commutator moves into contact with its brushes. Further movement causes the spiral commutator to be brought under the exciting brush, and the field current is thus gradually reduced. This brush is adjustable to enable the most suitable operating position to be found and fixed.

**Compulsory Working of Patents.**—The Manchester Chamber of Commerce has now issued a pamphlet in "reply to arguments used by the Council of the Chartered Institute of Patent Agents in their pamphlet of January, 1914" (ELECTRICAL ENGINEERING, Jan. 22nd, p. 48). It is made clear that it is not proposed that any alteration be made in the Patent Act, but an alteration of the rules affecting the interpretation of Section 27 so that the burden of proof in an application for revocation is placed on the patentee—an effect which was the object of those who drafted the Act in 1907, but was annulled by a legal decision. Safeguards are proposed to prevent "frivolous" applications for revocation. Among other charges, the Chartered Institute of Patent Agents argues that the motion brought forward by the Manchester Chamber of Commerce is contrary to the first principles of law, because it calls upon the defendant (patentee) to prove or disprove the plaintiff's (applicant's) case. The Chamber of Commerce, in reply, cites the case of a trader who applies to the Railway Commissioners for a lower railway rate, and is entitled to call on the company to prove that the rate they demand is reasonable. It is also pointed out that no machinery exists at the Patent Office for the applicant for revocation to obtain discovery by interrogatories.

**Electrical Trades Benevolent Institution.**—Mr. Hugo Hirst will occupy the Chair at the Annual Festival Dinner of the Electrical Trades Benevolent Institution, which is to be held on Wednesday, March 25th, at the Trocadero Restaurant. The annual general meeting will be held at the Institution of Electrical Engineers on Wednesday, March 18th, at 2.30 p.m. The Committee hopes for a large attendance.

## CAST IRON WITH THE PROPERTIES OF STEEL

A N electrolytic process for so reducing the impurities in cast-iron, and so altering its structure as to change it into what may be called steel, is being developed by the Vacani Syndicate, Ltd., at its private laboratory. We recently were afforded facilities for seeing specimens of the iron, in the form of rods about  $\frac{3}{8}$  in. in diameter, before and after treatment, and verified that there was a great increase in strength and a change in the structure, as shown by fracture. The results of tests have shown that a piece of an iron casting turned down to  $\frac{3}{8}$  in. in diameter had, after treatment, a tensile strength of 35.2 tons per sq. in., and an elongation of 27.5 per cent., on a length of 0.8 in. The fracture was designated as "silky." A rod about 11 in. long and  $\frac{3}{8}$  in. in diameter has shown, after treatment, a tensile strength of 45.1 tons per sq. in. and an elongation of 15 per cent. on a length of  $1\frac{1}{2}$  in. A similar rod, which was not treated, has shown a tensile strength of 9.9 tons. A small plate about  $\frac{3}{8}$  in. by  $\frac{1}{2}$  in. section, when tested, has shown a tensile strength of 29.4 tons per sq. in., and an elongation of 32 per cent. on a 1-in. length. The fracture was designated fibrous. In this case the percentage of impurities present in the cast-iron was reduced after treatment as follows:—Total carbon, from 3.147 to 0.074; graphitic carbon, from 2.484 to an undetermined amount; combined carbon, from 0.633 also to an undetermined amount; silicon, from 2.193 to 0.185; sulphur, from 0.109 to 0.013; phosphorus, from 1.080 to 0.275; manganese, from 0.477 to a trace; arsenic, from 0.035 to an undetermined amount; and nickel, from 0.036 to 0.050. The process, which is the subject of an application for a patent, depends on the treatment of the cast-iron in an electrolytic bath with a carbon anode, and also with a nickel cathode. Adjusting means are provided to vary the applied pressure in accordance with a scheme evolved by experiment, and during part of the treatment what is called a "high-fusion current" is passed. The offices of the Vacani Syndicate, Ltd., are at 52 Leadenhall Street, E.C.

**Electricity in Agriculture.**—Prof. J. H. Priestley has been carrying out (in conjunction with Mr. R. C. Knight) experiments to determine the exact functions of the plant which are affected by the applications of electricity to increase the rate of germination, growth, and yield of the plant, in continuation of the experiments mentioned in ELECTRICAL ENGINEERING of Oct. 30th, 1913, p. 603. So far, the results lead the experimenters to believe that the currents of from  $10^{-4}$  to  $10^{-4}$  amperes, which were employed, have no effect on the respiration of the plants other than that due to accompanying changes of temperature (which is, of course, absent in the field). The tests were made on germinating peas, and also on seedling peas, Brussels sprouts, wheat, and rye. The tests can, however, not be regarded as conclusive, as it is admitted that practically all the current was carried by the film of moisture surrounding the seeds and seedlings, the conductance of which was much higher than that of the seeds and seedlings themselves. It was also found that the gaseous products of the discharge in air had no effect on the germinating peas, but were deleterious to young seedlings. The experiments are described in a Paper published in the "Annals of Botany" (Vol. XXVIII., No. CIX., Jan., 1914).

**Sell's Directory.**—The 1914 issue of Sell's well-known and useful directory of registered telegraphic addresses is a bulky volume, and contains the usual alphabetical list of firms in the United Kingdom, with telegraphic addresses and telephone numbers, index to telegraphic addresses, classified trades list for the United Kingdom, as well as lists of British Empire overseas and foreign cable addresses. All information received from the Postmaster-General up to January 1st is included. With regard to the London addresses, it is noticeable that over 25,000 registrants have adopted the recently introduced indicator word system. The classified list embraces some 100,000 addresses, and the whole volume is most complete. Every care has been taken to confirm the entries, and to render all the information accurate. The very latest information which arrived too late for classification in the body of the work will be found in a separate list at the end.

**"Faraday House Journal."**—As usual, the current number of this periodical contains notes on the doings of Old Faradians, and some brief biographical notices, this time of Mr. P. V. Hunter and Mr. A. Beadle. The articles published include "Notes on the All-day Efficiency of Static Transformers for Use in Lighting Loads," by Mr. R. Crosbie-Hill, and Mr. W. J. P. Orton traces the development of switchgear for power schemes, and describes the specialised varieties in use at the present time. We note that the Annual Dinner of the "Old Faradians" has been arranged for Friday, May 1st, at the Hotel Cecil.

## CONDITIONS GOVERNING RAILWAY ELECTRIFICATION

THE first Paper of a series embracing the whole problem of railway electrification was read at the Institution of Electrical Engineers on Thursday last by Mr. Roger T. Smith. The Paper was also read at Birmingham on the previous Wednesday, and at Glasgow last Tuesday. The title was, "Some Railway Conditions Governing Electrification," and it dealt with present conditions in this country. Taking full advantage of track-circuit signalling and motor-coach trains with high acceleration and deceleration, a maximum of forty-eight trains an hour could be run each way during rush hours, said the author, while employing existing stations and tracks. The number of trains run and the increase in schedule speed had in many cases enabled the number of passengers carried to be doubled. The number of motor-coaches should be so chosen that the weight on the driving wheels was not less than 25 per cent. of the total train weight. It was more often 33 per cent., and could be as high as 100 per cent. Among the advantages of the multiple-unit-controlled motor-coach train were the doubling of terminal accommodation by halving the number of signal and locomotive movements, and the use of a train of length to suit the traffic. Most of the suburban services into and out of London already or in process of being electrified were run on tracks distinct from the main line, and such a service became a thing apart. It could be electrified on any system which best suited its conditions, and the method might be quite different from one subsequently desired for main-line electrification. The question was purely one of finance. Suburban fares had been falling steadily, and everybody in London and its suburbs was carried at too low a fare to give proper remuneration to any form of traction which, in addition to rates and taxes and Government duty on some fares, paid for its road and the right to use it. To make electrification really pay either fares must be increased or the price of energy delivered to the conductor must be reduced to about  $\frac{1}{4}$ d. per kw.-hour.

Coming to the question of the electrification of fast passenger services the author said that the engineering problems which had to be solved in this country had hardly been considered. Taking a modern 4-6-0 type of steam locomotive as representative, the adhesive weight was limited by structures to 60 tons and by usual practice to 56 tons. The starting draw-bar pull was limited to about 16 tons, and until a speed of about 12 m.p.h. was reached the maximum was 12 tons, determined by the adhesion. A constant output locomotive was satisfactory for this class of service, but, with the exception of certain three-phase locomotives in Italy and America, all electric locomotives had been built with series characteristics. The torque of the series motor, however, fell off so rapidly that above 60 m.p.h. no electric locomotive yet built for such maximum loads as obtained on our railways could give anything like 1,100 h.p. at 70 m.p.h., as was given by the 4-6-0 steam locomotive. One object of the series winding was to saturate the field of the motor at starting, and, provided it was saturated, no extra current was of use. The field could equally well be saturated by separate excitation, which opened out the possibility of a shunt characteristic with variable speed for the D.C. motor, voltage variation already providing several running speeds with the single-phase motor.

On the assumption that the passenger steam locomotive ran about 27,000 train miles in the year, and the electric locomotive 40,000 train miles (multiple-unit motor-cars ran 45,000 to 50,000 miles per annum), the mean cost for locomotive expenses (including capital charges) per train mile would be about 10 $\frac{1}{4}$ d., of which 3d. represented the cost of coal and water. If electricity could be purchased for  $\frac{1}{4}$ d. per kw.-hour, the cost of electricity per passenger-train-mile was about the same as the cost of coal and water in the steam locomotive. Thus the cost per train-mile with the electric locomotive would be 10 $\frac{1}{4}$ d. The capital cost of locomotives and the cost of energy must be reduced to show any advantage on the side of electrification.

For goods and mineral service the same ratio of cost between coal and electricity per train-mile would hold with electricity at  $\frac{1}{4}$ d. per kw.-hour. It was here that the electric locomotive appeared to have its best chance. As a general rule trains of more than sixty trucks were not conveniently dealt with in the lay-by sidings. This and the limited draw-bar-pull determined train weights. The mineral traffic of the North Eastern Railway on the east coast was, however, free from these drawbacks. Electricity could be purchased cheaply from the power companies. The mineral line between Shildon and Newport (Middlesbrough), a distance of eighteen miles,

was now being electrified. Two sub-stations would supply at 1,500 volts D.C. through overhead conductors and through a protected conductor rail. The locomotives would haul mineral trains of 1,400 tons at a speed of 25 m.p.h. on the level, and start an 800-ton train on a grade of 1 in 100. Apart from suburban, this was the most interesting railway electrification contemplated, and if successful it would be the real beginning of goods electrification. The arduous duties of a shunting locomotive could probably be best met by a single-phase locomotive.

The discussion in London was opened by Mr. H. W. Firth (G.E. Railway), who expressed himself in agreement with the author on most points. If a 100 per cent. load factor on a suburban service were possible, he said, then would an adequate return from electrification be obtained. He did not think that 48 trains per hour in each direction could be run in London on account of the flat junctions and terminal accommodation, but it might be maintained for about a quarter of an hour. As during the holiday seasons suburban trains were often called on to run over the main lines, the equipment must be suitable for both services. The characteristic of the motors must be made more flexible than it was at present. The author was not quite right in saying that with motor coaches the usual signal movements were halved and the terminal capacity doubled. On the Berlin Stadtbahn, under steam and electric services, the numbers of trains possible per hour were 32 and 40 respectively, and 21 and 33 respectively in the terminals. Thus the terminal factors were 0.656 and 0.825 respectively. On the question of goods traffic, he would say it was no use having a locomotive which could do 50,000 miles per annum. Many traffic schedules did not call for locomotives of greater capacity than existing steam locomotives. Mr. J. B. Sparks concluded that suburban working under electricity and steam conditions could not be economically compared. He suggested that it would be most dangerous to work two different systems. He could not agree with the author's estimate of costs, and he criticised these in detail. With main-line electrification they must remember that there would be a saving due to reduced coal haulage of about 4.6 per cent. Also only 70 per cent. of the number of steam locomotives would be required under electrical conditions. The Pennsylvania Railway obtained an average of 30,000 miles per annum per electric locomotive, based on an average of 33 locomotives and the New York Central on an average of 28 locomotives about 28,800 miles. Dr. S. P. Smith (City and Guilds, Engineering, College) suggested a design for a locomotive to give 1,100 h.p. at 70 m.p.h. with a draw-bar pull not exceeding 12 tons at starting. He appeared to hope that all railways would be compelled by law to electrify their lines for a certain distance from London. Mr. W. M. Mordey argued that the whole lay-out of railways was bad, and that instead of demanding cheaper locomotives and reduced prices for current, the railway companies should look to the problem of regeneration in some form. The Central London Railway and the Liverpool Overhead Railway were good examples of what could be done in this respect. Mr. H. M. Sayers thought that it would pay most lines to electrify, even though this was not always, perhaps, apparent. Mr. Roger T. Smith, in his reply, said that the figure of 48 trains per hour in each direction given in the Paper was lower than the figure of 50 which had passed unchallenged through Parliamentary Committee Rooms. They were already running 44 and 45 trains per hour on the District Railway, and this number would shortly be increased to 48. He had taken Great Western Railway conditions as a basis for his figures of mileage of locomotives. On the Harrow section of the Metropolitan Railway the electric locomotives had run double the mileage of former steam locomotives.

**The International Rubber Congress.**—At the International Rubber Exhibitions of 1908 and 1911, papers were read on everything connected with the production of rubber, and discussions followed that brought to bear the experience of experts from every rubber-growing country in the world. Those papers and discussions were fully reported and reproduced in two books that form valuable works of reference on every question connected with the industry. Mr. Henry A. Blake, President of the fourth Rubber Exhibition and International Rubber Congress, which opens on June 24th, will be glad if any persons who desire to read Papers on any subject connected with the growing, curing, or manufacture of rubber, or the possible expansion of its uses, or to take part in the discussions, will kindly communicate and register their names as early as possible with the Hon. Secretaries of the International Rubber Congress, Exhibition Offices, 75 Chancery Lane, London, W.C.

**Reinforced Concrete.**—The February number of "Concrete and Constructional Engineering" contains an illustrated article on the new offices for the Board of Agriculture and Fisheries. An interesting account is also given in an article by Mr. E. R. Matthews (Borough Surveyor, Bridlington) on the application of concrete and reinforced concrete construction in some recent municipal works at San Francisco. Other matter contained in the number includes illustrated descriptions of the concrete construction at the Hydro-Electricity Works, Chester; some harbour improvements at Iloilo, Philippine Islands; a water tower at Burton-on-Trent; and a gasholder tank near Hamburg.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,379.

It is required to bring a voltage of 275 A.C. down to 250. Is a choking coil the right solution? If so, give full particulars necessary to make one for a full-load current of 40 amperes at 50 cycles.—"SPARK."

(Replies must be received not later than first post, Thursday, Feb. 26th.)

### ANSWERS TO No. 1,377.

What are the more usual methods, other than the use of automatic regulators, for compounding alternators? How is the compounding effected, and what are the relative advantages of the different methods? Also, is it practicable to "over-compound" a machine in this way.—"F. M."

The first award (10s.) is given to E. P. HILL for the following reply:—

The principles upon which compounding of alternators is effected may be classified as follows:—(a) Inherent field reaction (typified by Walker system); (b) exciter field reaction method (Rice system); (c) rectification method (Heyland system). The first method has been found to be quite satisfactory for ordinary central station units of medium and large capacity, and has the advantage that an ordinary exciter is employed, the compounding being provided by the load current in the stator windings reacting on an unsaturated portion of the main generator field. Fig. 1 shows the principle for a salient pole rotor, the

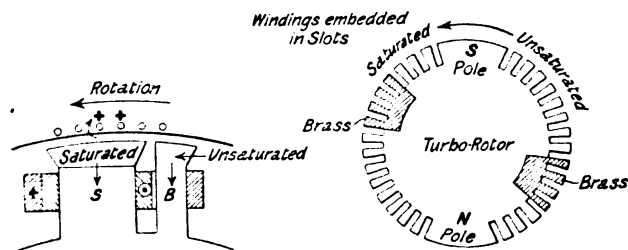


FIG. 1.

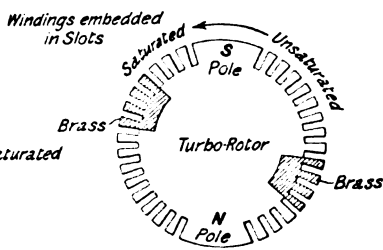


FIG. 2.

same method being modified by the Westinghouse Co. for their cylindrical turbo-rotors, as shown in Fig. 2. *S* is the normal field path, which is in this case designed so as to be almost saturated; the by-pass path for the flux is unsaturated and at no load is unmagnetised. As the load increases the cross-magneto-motive-force tends to weaken *S* and strengthen *B*. *S* can alter very slightly only, whereas *B* becomes strongly magnetised, and a higher total flux results in the alternator voltage rising or remaining constant as the design allows. The method is unsuited for lower power-factor systems than 0.8, as the wattless component demagnetises *B* and causes greater voltage drop than normal. Central stations of to-day rarely run on heavy loads with such a low power-factor on account of the large proportion of rotaries in use, and the simplicity of its automatic regulation renders the method very valuable in view of the fact that the safety of the machine is not impaired, as the short-circuit current is identical with that of an ordinary standard

alternator. Many of the largest units in Great Britain are compounded on the above system, which is due to Prof. Miles Walker.

The second method (exciter field reaction) requires a special exciter having a rotary converter type armature. For a three-phase alternator the secondaries of current transformers in mains are connected to three slip-rings, so as to produce a rotating field in space around the exciter armature proportional to load on alternator. This reacts on the ordinary exciter field system, and by it on the alternator field. The beauty of this method is that low power-factor in load causes strengthening of exciter field (by virtue of the usual synchronous motor effect) in exciter, leading current weakens field, and a fairly accurate adjustment is therefore obtainable over a wide range of conditions. This method is referred to often as the compensation method, and is best applied to three-phase work. It was originated by Mr. Rice, of the American G.E.C.

The development of the third, or rectification, method by A. Heyland in connection with three-phase alternators has found favour on the Continent, but has not been largely used in Great Britain. It requires an expensive exciter or rectifier, which is liable to commutation troubles, but has certainly been perfected by the patentee to bring it into commercial use, and enable it to give its good regulating performance. He now uses for the supply to his rectifier a series and a shunt transformer, so as to obtain on the main field a constant set of pulsations (unidirectional) and a variable set proportional to the load on the machine. The transformers are so connected that compounding voltage leads the steady voltage in phase, the resultant pulsations being greater the lower the power-factor. The alternator poles are standard, but the field coils are in several parallel paths to damp out pulsations.

There are several other methods in use which are modifications of the three principles reviewed. The Parsons method is worthy of mention; it has the disadvantage that power-factor is not automatically compounded for, but, as previously mentioned, this to-day in heavy units is not necessary. The principle upon which their compounding obtains is analogous to the Walker method, except that the exciter is used instead of the main field. A bye-pass is provided across the exciter field system, and the leakage flux is regulated by the load current (through transformers), so that on heavy loads the leakage path is of high reluctance and the lines of force take the normal path across the airgap and through exciter armature, therefore raising alternator voltage. All these methods are capable of overcompounding except method A on very low power-factors.

The second award (5s.) is made to "A. H. B.," whose reply may be summarised as follows:—

Since the regulation of an alternator is worse at lagging power-factors than at unity, any compensating device other than a regulator directly controlled by the voltage itself must be dependent upon the power factor as well as the actual current taken from the machine.

In some systems a commutator is used to rectify the secondary current from a current transformer in the line. This rectified current is passed through a "series" winding on the alternator field, usually smoothed out by means of reactances and shunt resistances, so as to avoid excessive eddy currents in the field magnets. In polyphase machines the connections to the different phases can be made so as to give a larger rectified current as the power factor of the load decreases, and thus the alternator can be either flat compounded or over-compounded for all loads and power factors likely to be experienced. A simple commutator having two or three bars per pair of poles can be used, but a better system is that of Heyland, though it is somewhat more complicated. Instead of a commutator, a mercury vapour or similar rectifier can be used. The rectified current may be used on the exciter field instead of the alternator field. In other methods the alternating current from the transformer, instead of being rectified, may be fed direct into the exciter armature by sliprings. If the arrangement of theappings is such that this current is approximately 90° in advance of the load current in the exciter armature, it will tend to increase the exciter field, but in all these methods there is a time-lag due to the self-induction of the alternator field.

"A. H. B." then describes the Miles Walker compounding system, which he regards as the best system so long as the power factor can be relied upon not to fall below about 0.85. The laminated iron leakage path method described in the previous reply is also mentioned.

**Shipping, Engineering and Machinery Exhibition.**—Admiral H.S.H. Prince Louis of Battenberg, First Sea Lord of the Admiralty, will open the Shipping, Engineering and Machinery Exhibition at Olympia on September 25th, at 3 o'clock.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A Paper by Mr. P. R. Coursey was read at the Institution of Electrical Engineers Students' Section meeting on January 28th. Mr. W. Duddell occupied the Chair. The author reviewed briefly some of the principal types of portable wireless apparatus that are now in actual use. The tendency in modern apparatus of this character is to use transmitters having flat resonance curves, with unidirectional aeriels, and receivers capable of very sharp tuning so as to be able to differentiate between different transmitting stations to the utmost degree. They are obtainable in sizes from 0.04 kw., with a maximum range of about twelve miles, up to 1.5 kw., with a maximum range of about 250 miles, arranged for different modes of transportation. A recent innovation by the Marconi Co. is a small set for aeroplanes. A trailing wire attached by a safety plug, arranged to release the wire in case of extra strain, is generally used as aerial, and the metalwork of the machine serves as the counter capacity in place of earth. For short-distance communication it is possible, however, to do away with the trailing cable and mount the wire in the machine itself. It is difficult to receive messages by telephone on account of the noise of the engine, but the Fleming oscillation valve is not so much affected as other detectors, and gives a loud signal. A new type of portable apparatus devised by Mr. Dubilier has undergone successful trials. The transmitter complete in box weighs about 30 lb., and with 75 to 100 watts gives a range of thirty to forty miles when used with an inverted "L" aerial some 50 ft. high. The apparatus sends a pure musical note by means of a series of unidirectional impulses obtained from regular condenser discharges, giving a note or spark frequency of 500 to 750 per sec. This is obtained by impressing between 50 and 250 volts on the terminals T T in the

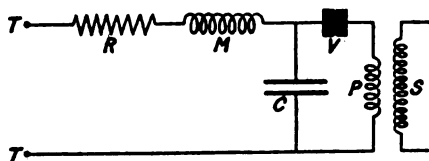


figure. M and P have high inductance. M controls the vibrating contacts V. It takes about 0.001 sec. for these to open. At the instant of break the condenser C (of about 3 to 4 mfd. capacity) is charged to a higher voltage than that of the supply on account of the self-induction M. After a further period of 0.001 sec. the contacts V close again, and the stored energy of C discharges through P, while C and P are so proportioned that the first half-wave of the discharge is completed in exactly 0.001 sec. from the closing of the contacts, so that they break at the instant of zero current. P is made the primary of a step-up transformer of the open-circuit type with well laminated core. The secondary S is tuned to the primary, so that the secondary pressure is further augmented and feeds a multiple gap quenched discharger of thin metal plates. The usual oscillation and aerial circuits are connected across the gap, though an ordinary open spark may be used without much impairing the note. The tuning and efficiency, however, is not so good. A portable wireless telephone by the same inventor is said to have given a speaking range of about 500 miles, using 2 to 3 kw. at 500 volts. This feeds a quenched arc which produces continuous oscillations above the limits of audition. A multiple microphone is used in the aerial circuit. In another ingenious apparatus, due to M. Magunna, tuning forks control contacts shunted by a condenser. Up to 5 amperes at 220 volts can be regularly broken. A range of fifty miles by day has been reached with an expenditure of about 300 watts. On January 23rd the author read a Paper before the Physical Society entitled, "Some Characteristic Curves

and Sensitiveness Tests of Crystal and Other Detectors." The investigation showed that in the majority of cases the second differential of the characteristics gives a good indication of the sensitiveness of the detector, as in the case of the oscillation valve, but that some detectors, notably the galena and electrolytic, seem to show that there are other actions at work which may oppose the one depending on the curvature of the characteristic. Since this also occurs with one of the electrolytic detectors tested, it perhaps points out that this other action may be electrolytic in nature.

A motor-driven lifeboat, just fitted to the Allan liner *Alsatian*, is provided with a wireless outfit having a range of about 100 miles.

The Inspectors of the United States Department of Commerce have recently been compelled to refuse permission for several steamships to leave American ports owing to the bad installation and repair of the emergency wireless apparatus carried.

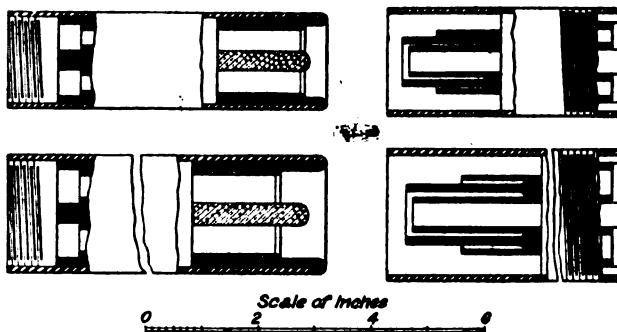
An issue of £200,000 6 per cent. bonds at 97 will, it is believed, be shortly made by the Constantinople Telephone Co.

On the 3rd inst. censorship on messages for the Union of South Africa was announced, as well as the interruption of the lines of the Indo-European Telegraph Co. between Rowno and Odessa, which were restored on the 4th inst.—The Zanzibar-Mombasa cable was repaired on the 6th inst.—The Compagnie Française des Câbles Télégraphiques are once again troubled by the breakdown of their section between Paramaribo and Cayenne, and messages for the latter place have to go via Western. The Ceuta-Tangier cable has also failed, and messages going by other than Eastern routes are sent by boat from Cadiz or Algeciras, and are therefore subject to delay.

## ELECTRIC TRACTION NOTES

At the annual meeting of the Great Eastern Railway Co. on Friday last, Lord Claud Hamilton announced that Mr. Henry W. Thornton, General Superintendent of the Long Island Railroad, New York, had been appointed to succeed Mr. Walter Hyde as General Manager of the Great Eastern Railway. Mr. Thornton has had experience in connection with the congestion of suburban traffic in New York and the problem of electrification. No doubt an improvement in the suburban service of the Great Eastern Railway may be effected by its conversion to electric traction.

The standard forms of charging plugs for electric vehicles recently adopted by the Electric Vehicle Association of America are shown below. The drawings have been made from information contained in the American electrical



journals. The upper plug and socket is of 50-ampere capacity, and the lower plug and socket is of 150-ampere capacity. The Nation Board of Fire Underwriters has approved the plugs for overloads of 50 per cent. The outer contact is of positive and the inner contact of negative polarity.

The Board of Trade has sanctioned the use of petrol-electric trams on the front at Hastings in substitution for the Dolter surface-contact system.

**The Unrest among Electrical Workers in London.**—There is no new development at present, and the position is much the same as that reported in our last issue. Both the central station employees and the wiremen are working contentedly. The Association of Electrical Station Engineers has received courteous acknowledgments of its letter from the majority of the supply authorities and electric railway companies, and the Electrical Trades Union are awaiting the amended working rules and rates of wages from the London Electrical Masters' Association.

"Telephone Cables." By J. C. Slippy, of Pittsburg. 147 pp. 7 in. by 4½ in. 97 figures. \$2.50. This small volume constitutes a useful epitome of American practice with regard to the specification and lay-out of the cable part of the telephone network, particularly overhead work. THE KILOWATT PUBLISHING Co., LTD., Temple Chambers, London, E.C., holds a small stock of this book, and will be pleased to supply copies at 10s. 6d. net each.



## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Feb. 12th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

23,689/12. **Combined Turbo-Alternator.** A. ROLFE. The alternator is of the induction type. The windings are embedded in the turbine rotor and casing. Constructions for other types of generator are also given. Eight figures.

1,442/13. **Lamp Filament Supports.** J. M. ROUX and J. SANCHEZ. The supports are curved and diverge from one end to the other with their concave sides outwards. These supports may be combined with others in the same bulb. Six figures.

1,939/13. **Dischargers for Wireless.** W. TORIKATA, E. YOKOYAMA, and M. KITAMURA. The stored energy in an inductance and electromagnet cause the gap to be broken down a moment after current is applied. The magnet has two armatures controlling circuits feeding the gap, so that the discharge is maintained. One figure.

7,376/13. **Telephone Call Meters.** A. STERRY. A switch, buzzer, and counting mechanism are fitted to each subscriber's telephone. When a call is made the subscriber closes the switch which works the buzzer and the counting mechanism. The operator, hearing the buzz, makes connection. A meter can also be situated in the exchange. Four figures.

16,481/13. **Carbon-Cobalt Filament.** C. KANAZAWA. A raw filament is prepared from cellulose solution containing cobalt oxide and manganese sulphate in a solution of zinc chloride. This filament is heated to a white heat in a crucible with graphite under vacuum for over 20 hours. It is said that the filament is strong, efficient, and has a long life not affected by vibration.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** *PODMORE* [Insulators] 1,658/13; *SIMON, ROBERTS and CHADWICK* [Storage battery charging] 2,469/13; *B.T.-H. Co. (G.E. Co., U.S.A.)* [Motor control] 3,684/13; *TORPEY* [Insulating slabs] 15,975/13.

**Dynamos and Motors:** *LEE and OLDFIELD* [Variable speed constant output dynamos] 1,990/13; *RUBEL* [Dynamo iron] 3,445/13; *VANDERVELL and MIDGLEY* [Ignition] 5,013/13; *B.T.-H. Co. (French Thomson-Houston Co.)* [Regulation] 6,285/13.

**Electrometallurgy and Electrochemistry:** *MARKS (Elec. Smelting & Aluminium Co.)* [Fertilisers] 2,485/13; [Di-calcium phosphate] 2,486/13; *GIULINI* [Aluminium] 8,166/13; *SIEMENS BROS. (Siemens & Halske A.-G.)* [Röntgen-ray tubes] 20,482/13.

**Heating and Cooking:** *WEAVING and FERRANTI Co.* [Ovens] 8,962/13.

**Ignition:** *LECOCQ and VAN DER AA* [Motor starting] 14,799/13; *DUPONT* [Automatic motor starting] 15,269/13.

**Incandescent Lamps:** *B.T.-H. Co. (G.E. Co., U.S.A.)* [Tungsten] 1,915/13; *HAYNES* [Alloys with cobalt] 2,487/13; *LOWDEN*, 7,722/13.

**Meters:** *BRITISH INSULATED Co. and WILSON* [Prepayment] 4,472/13.

**Switchgear, Fuses and Fittings:** *ELECTROMECHANISCHE INDUSTRIE GES. and HERRMANN* [Miniature lighting switch] 1,895/13; *HORSTMANN and EDGAR* [Time-switches] 2,588/13; *WILLIAM MCGEOCH & Co. and REYNOLDS* [Switches] 2,757/13; *B.T.-H. Co. (G.E. Co., U.S.A.)* [Switches] 3,462/13; *LUNDBERG and PEGG* [Plugs and sockets] 11,960/13; *DAVIES and BODELL* [Locking incandescent lamps in their holders] 18,568/13; *REEVES* [Anti-vibration device for lamps] 19,857/13; *HULBERT* [Regulators] 23,110/13.

**Telephony and Telegraphy:** *MARCONI* [Transmitters for wireless] 2,918/13 and 2,919/13; *GIRARDEAU* [Feeding wireless aërials] 14,035/13; *WESTERN ELEC. Co. (Western Elec. Co., U.S.A.)* [Telephone transmission circuits] 20,179/13; *WIDEGREN* [Transmitter for writing telegraphs] 29,241/13.

**Traction:** *HELFENSTEIN* [Track contacts] 8,267/13.

**Miscellaneous:** *EISENMANN* [Musical instruments] 24,260/12; *LAKE (Elec. Boat Co.)* [Submarines] 1,912/13; *BRUNN* [Surfaces for controlling electrically operated mechanism] 2,295/13; *ATTWATER* [Miners' safety lamps] 2,372/13; *BROWN, BOVERIE ET Cie and THALLMAYER* [Braking of machinery] 2,586/13; *MACKENZIE (Cook Rly. Signal Co.)* [Battery compounds] 7,298/13; *BENTLEY* [Clocks] 8,464/13; *FEDERICO and SEGALIN* [Controlling electric clocks] 12,638/13; *SAND* [Quartz-glass, &c.] 15,629/13; *ARON* [Motor-car headlamps] 17,502/13; *STEPHENSON* [High-pressure indicator] 18,975/13; *HITZELBERGER and NEW BRITISH EVER-READY Co.* [Electric torches] 24,943/13.

The following Specifications are open to inspection at the Patent Office before acceptance, but are not yet published for sale.

**Dynamos, Motors and Transformers:** *BETHENOD* [Maintaining a dynamo at constant pressure] 27,945/13; *HEINZ* [Electrolytic A.C.-D.C. converter] 28,630/13; *SIEMENS SCHUCKERTWERKE GES.* [Regulating torque of polyphase motors] 1,640/14.

**Electrometallurgy and Electrochemistry:** *AUGUST SCHWARZ* [Carbon electrode holders] 24,900/13; *NORSK HYDRO-ELEKTRISK-KVALSTOFABRIKSELSKAB* [Reduction of nitrate of lime and other salts to powder] 468/14.

**Switchgear:** *BERAUD* [Time switches] 945/14.

**Telegraphy:** *NIGRON* [Printing receivers] 1,548/14.

**Traction:** *JULIUS PINTSCH A.-G.* [Signalling] 3,561/13.

**Miscellaneous:** *GIRARDELLI* [Transmission from a distance of adjusting movements] 1,265/14.

The following Amended Specifications may now be obtained:—

**Dynamos:** *A. H. MIDGLEY and C. A. VANDERVELL*, 9,112/11.

**Telegraphy and Telephony:** *W. P. THOMPSON (Ges. für Drahtlose Telegraphie, Germany)* [Wireless transmitter] 16,827/12.

### Application for Restoration of Lapsed Patents

15,544/09, 15,681/09, and 15,682/09. **Switchgear, &c.** *BERTRAM THOMAS and E. THOMAS*. Application has been made by the patentees for restoration of these patents, which expired during July, 1913, owing to the non-payment of the renewal fees. The first patent relates to an electro-magnetic crane brake, the second to an enclosed disc-type controller, and the third to a current collector for use in electric jib cranes.

### Amendment to Specification

16,827/12. **Wireless Transmitters.** *W. P. THOMPSON (Ges. für Drahtlose Telegraphie, Germany)*. As a result of the extended investigation under Section 8, this specification has been amended by way of disclaimer.

### Grant of Patent Allowed

9,981/12. **Drawn Tungsten Filaments.** *C. H. FISCHER*. The Comptroller has decided to allow the grant of this patent [ELECTRICAL ENGINEERING, May 8th, 1913, p. 264, Vol. IX.], in spite of the opposition.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

3,343 of Feb. 20th, 1900. **Siphon Recorder:** *Curbing. A. MUIRHEAD*. To improve the character of telegraph signals received by a siphon recorder or recorder coil relay, the movements of the signal coil are curbed by local means actuated by the received current. The relay to effect this has a moving contact composed of three insulated conducting sections, of which the central one is in a common local circuit.

3,461 of Feb. 21st, 1900. **Automatic Electro-Magnetic Brakes.** *WESTINGHOUSE BRAKE Co. (F. C. Meewell and F. M. Herr, U.S.A.)*. The brake-shoe is divided into parts of different section. Each has its own coil so designed that each shoe is saturated at a different current. The magnetic is interconnected with a mechanical brake so that the latter is applied by the former. The strength of the magnetic brake can be adjusted and the number of sections of the shoe operative varies with the current.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** *E. GIRAUD* [Overhead line construction] 20,687/05; *A. C. and R. H. MARTIN* [Train lighting systems] 23,755/06; *B.T.-H. Co. (G.E. Co., U.S.A.)* [Gun turret and printing press motor control] 23,894/06 and 23,896/06; *M. KALLMANN* [Motor control] 9,859/08.

**Dynamos and Motors:** *H. G. REIST* [Ventilating] 23,710/07.

**Ignition:** *R. AYTON*, 23,810/06.

**Incandescent Lamps:** *W. FAIRWEATHER (Glühlampenwerk Anker Ges., Germany)* [Filament manufacture] 23,585/07.

**Switches, Fuses, and Fittings:** *B.T.-H. Co. (E. M. Hewlett, U.S.A.)* [Overload loose-handle circuit-breaker with magnetic blow-out] 19,498/00.

**Telegraphy:** *C. MEYER* [Order telegraphs or alarms] 18,670/07; *S. G. BROWN and J. A. L. DEARLOVE* [A submarine cable is tuned to the frequency of maximum speed] 23,977/07.

**Traction:** *B.T.-H. Co. (F. E. Case, U.S.A.)* [Multiple-unit control: Control current supplied by storage batteries] 19,499/00; *E. J. CHAMBERS* [Rail insulators] 23,201/04.

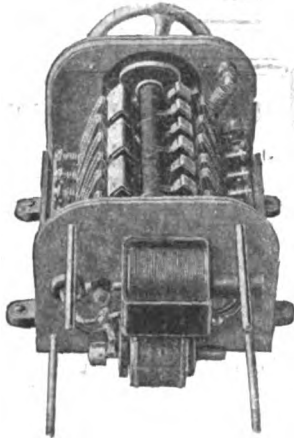
**Miscellaneous:** *J. GOEHST* [Illuminated signs and lamp-holders] 23,224/03, 23,225/03, and 23,226/03; *M. R. HUTCHISON* [Motor-car horns] 21,823/05; *W. FAIRWEATHER (Aktiebolaget L. M. Ericsson & Co., Sweden)* [System of secondary clocks] 22,713/08.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 109. —

### A "STAR-DELTA" DRUM STARTER

A ROBUST drum-type "star-delta" starting switch, manufactured by the Igranic Electric Co., Ltd. (147 Queen Victoria Street, E.C.), has recently been put on the market after exhaustive trials. Only mica insulation is used. The carcass of the switch is of cast-iron, with a strong sheet-iron front cover. The fingers are carried on massive supports clamped to an iron supporting bar. Each support is separately insulated by mica from the others and from the bar. Each finger is directly attached to its terminal, so that the effect of each external connection is plainly seen, and all screws are very accessible. Each finger is a long brass punching with a copper tip, and is easily removable independently of any other. It is held in contact with the shoe by a steel spiral compression spring, the result being that it makes a straight line contact with the shoe and makes "stutting" (or doubling up of the fingers) impossible.



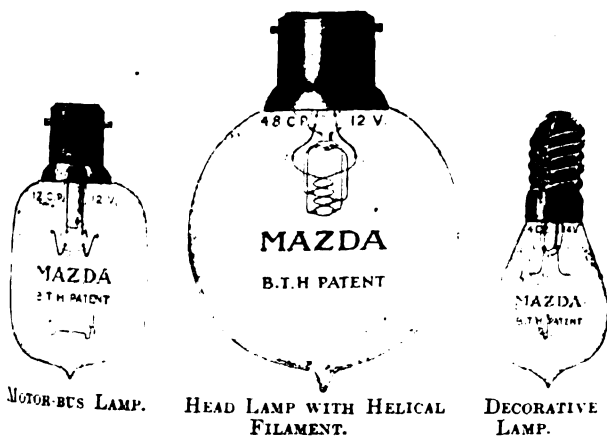
"IGRANIC" STAR-DELTA  
STARTER.

This method of fixing ensures great flexibility of movement and at the same time ensures good electrical connection between the finger and the terminal. All the springs are plainly visible and easily accessible, and they are not used to carry current. The copper shoes are secured to the drum by countersunk screws, and are, consequently, easily renewable, the whole drum being readily removable from the case or any section from the shaft. A pointer rigidly attached to the operating handwheel registers with an index plate on the outside of the case, and shows whether the switch is in the "off," "start," or "run" position.

To start the motor, the movement of the hand-wheel is clockwise throughout, so that it is not possible to go from the "off" to the "run" position without passing through the "start" position. The illustration shows the internal arrangements, including the neat automatic overload and no-volt releases. We understand that the Company has standardised five different types of this starter, and any of them can be made suitable for oil immersion.

### MAZDA AUTOMOBILE AND BATTERY LAMPS

A NEW price-list has just been published by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper



MOTOR-BUS LAMP.

HEAD LAMP WITH HELICAL  
FILAMENT.

DECORATIVE  
LAMP.

Thames Street, E.C.), giving revised data and reduced prices of drawn-wire automobile and battery lamps, as now standard-

ised by the leading lamp manufacturers of this country. The range of Mazda automobile lamps is very complete, and includes headlight lamps, with special Mazda design of helical filament, sidelight lamps, tail and dash lamps, interior lamps, steering-pillar lamps, &c., &c. In addition to these, the new list covers special types of low-voltage lamps for motor-buses, hand-lamps, and general battery service, illumination lamps, and flashlight lamps, for all of which there is a considerable demand. The "automobile" lamps can, of course, be employed for many other purposes, such as for motor-boats, yachts, aeroplanes, airships, carriages, &c. The head-lamps with helical filaments are suitable for all kinds of projection work, and have been used most successfully in magic lanterns and small cinematograph projectors. The arrangement of the helical filament gives a close approximation to the point source of light, which is the ideal for use with a parabolic reflector, when a parallel beam of light is required. All Mazda automobile and battery lamps are rated at 1 watt per c.p., and, owing to the shortness and thickness of the filaments, and the special methods of support employed, can be relied upon to be proof against all the shocks and jars incident to automobile service.

### "EYE-REST" FITTINGS FOR HALF-WATT LAMPS

THE British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), have developed a range of "Eye-Rest" indirect lighting fittings for use with half-watt lamps. Nine types have been developed, consisting of standard metal or moulded composition bowls and suspensions



ADAMS' "EYE REST"  
HALF-WATT FITTING.



CLASSICAL "EYE REST"  
HALF-WATT FITTING.

with the addition of suitable ornamented housings covering the holder and neck of the lamp. Two of the designs are illustrated here. These fittings provide an effective means of adapting the half-watt lamp to interior lighting, and the coming of the Mazda "Half-Watt" lamp, by rendering indirect lighting twice as efficient as formerly, will undoubtedly increase its vogue.

**MICA** BRITISH MICA CO., LD  
Contractors to  
H.M. Government,  
Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—405 P.O. Putney  
Tele.—"Micamini," London.

Plate Tubes,  
Rings, &c., in **MICANITE**

**GLASS TUBES  
AND RODS**  
FOR ELECTRICAL PURPOSES  
**GUILBERT-MARTIN**  
9, Edmund Place, LONDON, E.C.

**WERTHS & CO.**  
41, Aldersgate Street, LONDON, E.C.  
**VULCANWAX**  
THE BEST INSULATING AND IMPREGNATING  
MATERIAL FOR CABLES AND WIRES

**James Macintyre & Co. Ltd**  
Manufacturers of  
**PORCELAIN  
INSULATORS**  
of every  
description  
Washington Works, Burslem.

The Micanite & Insulators Co., Ltd  
WALTHAMSTOW,  
London, E.

FOR **FIBRE**  
SHEETS, RODS  
AND  
TUBES.

**F. WIGGINS & SONS,**  
FOR **MICA** INSULATION  
102, 103 & 104, MINORIES, LONDON.

### HALF-WATT LAMPS AT HARRODS

SO far as the half-watt lamp is concerned, Messrs. Harrods, Ltd., take pride of place, in that we understand they are able to boast the first half-watt lamp installation in the United Kingdom. The units employed are half-watt Osram lamps, 100-volt, 500-watt, connected two in series on 200 volts. These are contained in G.E.C. sphere fittings, as shown in the illustration. Each fitting contains one half-watt lamp, and



replaces one of the arc lamps previously used, which were run two in series. The fittings are provided with "Equiluxo" glass spheres. The photograph from which the illustration is reproduced was taken entirely by the light of the half-watt lamps, and gives a good idea of the excellent light distribution obtained. The colour of light as compared with the colour of light from the old arcs is vastly improved, having whiteness without the excess of blue given by the arcs; consequently coloured fabrics are shown to great advantage.

### NEW SIZES OF HALF-WATT LAMPS

A WIDER range of half-watt lamps than has so far been available is now on the market, according to a price-list of "Nitra" half-watt lamps issued by the A.E.G. Electric Co., Ltd. (133-135 Oxford Street, W.). A description of these lamps was given in ELECTRICAL ENGINEERING for January 15th. Two peculiar features are the use of a flint-glass pipless bulb and the method of mechanically fixing the cap to the glass lamp-neck. The full range in which the lamp is now made is:—50-65 volts, 200, 400, 600, and 1,000 c.p.; 100-130 volts, 400, 600, 1,000, 1,500, 2,000, and 3,000 c.p.; 200-260 volts, 1,000, 1,500, 2,000, and 3,000 c.p. The candle-power figures give the mean value measured over the lower hemisphere with the lamp in a clear globe, and without reflector. The 200- and 400-c.p. sizes for 50-65 volts are new, as are the 400- and 600-c.p. sizes for 100-130 volts, and the 1,000- and 1,500-c.p. sizes for 200-260 volts.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**DISTRIBUTION BOARDS.**—A card from the Metallic Seamless Tube Co., Ltd. (Meta House, Corporation Street, Birmingham), gives particulars of distribution boards in teak and iron cases.

**INSTRUMENTS.**—A new leaflet just published by Crompton and Co., Ltd. (Chelmsford), gives particulars of ammeters and voltmeters of the moving coil and moving iron type in strong pedestal pattern cast-iron cases suitable for mounting direct on iron-clad controlling pillars or angle-iron framework.

**REFLECTORS, &c.**—Krupka & Jacoby, Ltd. (26 to 36 Chapter Street, Westminster, S.W.), have sent us a new leaflet describing several patterns of "Benjamin" opal and steel reflectors, cargo light, and other weatherproof fittings, and shock-proof hand lamps.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Aberdare.**—Transformer, high- and low-tension switchgear, and cables. Town Clerk. February 28th.

**Aberdeen.**—An additional 1,000-kw. La Cour converter is to be installed.

**Barnes.**—Distributor cables. Borough Electrical Engineer. February 20th. (See advertisement on another page.)

**Bexley.**—One 500-kw. turbo-alternator, condensing plant, water-tube boiler, superheated and mechanical stoker. Borough Electrical Engineer. February 25th.

**Carlisle.**—Cables in connection with supply to Scotby.

**Christchurch (N.Z.).**—A loan of £100,000 has been floated for the extension of the electrical plant under the city scheme.

**Cumberland.**—The Whitehaven Hematite Iron & Steel Co., Cleator Moor, has decided to lay down waste heat electric generating plant of 1,000-kw. capacity. As pointed out in a recent issue, the Cumberland Electricity & Power Gas Co.,

For instructions on Cleaning and Polishing  
Electrical Fittings and Electric Cookers, read

### CANNING'S HANDBOOK ON POLISHING, ELECTRO-PLATING & LACQUERING.

Fully Illustrated. Price 2s. 3d. post free. Abroad, 2s. 6d.

**W. CANNING & CO., BIRMINGHAM.**

LONDON: 18/20, ST. JOHN'S SQ., CLERKENWELL, E.C.

MENTION BOOK No.

**MARRYAT** **ARMATURE** **REPAIRS** **& PLACE**  
DYNAMO & MOTOR HOSPITAL, 28, MATTON GR., LONDON, E.C.

whose powers have now lapsed, intended to work upon these lines.

**Dartford.**—A L.G.B. inquiry was held last week concerning a loan of £11,000 for new plant. The scheme of extensions is to instal high-tension plant in order to supply in bulk to the West Kent Electric Power Co. primarily to enable that Company to supply in the Crayford area. The terms are that the agreement shall be for seven years on the basis of a standing charge of £4 5s. per kw. on 350 kw. of plant, with a minimum supply of 1,000,000 units per annum at 0.3d. per unit. In addition, the new plant will enable the Council to deal with the increase in the number of factories now being erected in the Dartford area. There was some opposition to the proposal on the part of the ratepayers, who characterised the scheme as "wholesale gambling with the ratepayers' money."

**Dublin.**—One 210-B.H.P. three-phase E.H.T. motor for use in connection with existing motor-generators at Fleet Street power-house. City Electrical Engineer. March 2nd. (See advertisement on another page.)

**Harrogate.**—The L.G.B. has sanctioned a loan of £7,639 for electrical extensions.

**Ipswich.**—A L.G.B. inquiry was held last week with regard to the following loans:—Mains, £21,000; services, £3,000; motors for hiring, £4,000. The inspector (Mr. H. R. Hooper) and Mr. F. Ayton, the Borough Electrical Engineer, had a little controversy as to the desirability of taking up a loan for motors in preference to purchasing them outright. Mr. Ayton said that it was impossible to go ahead on the latter lines, as in very few cases could the users be induced to purchase the motors.

**Kettering.**—A L.G.B. inquiry was held last week concerning a loan of £12,000 for electrical extensions, of which £2,000 is for mains and services. A new turbo-generator is to be installed.

**Lowestoft.**—A loan of £950 for meters is to be taken up.

**Northampton.**—The Northampton Electric Light & Power Co. is to increase its capital in order to instal new plant.

**Rhyl.**—A L.G.B. inquiry was held last week concerning a loan of £3,900 for electrical extensions.

**Southampton.**—Rotary-converter; balancer; D.C. meters. Borough Electrical Engineer. March 9th. (See advertisement on another page.)

**South Africa.**—H.M. Trade Commissioner for South Africa states that the Paarl, Cape Province, Council will be inviting tenders in South Africa for turbo-alternators, switchgear, transformers, cables, meters, &c. Copy of the specification, &c., may be seen at 73 Basinghall Street, E.C.

**Warrington.**—A L.G.B. inquiry was held last week concerning a loan of £14,550 for extensions at the power station. There was some ratepayers' opposition on the ground that the present charges to consumers are too high.

#### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Beckenham.**—New school, Balgovan Road. Clerk.

**Croydon.**—Nine houses, Albert Road. Maides & Harper, Albert Road.—Cinematograph theatre, London Road, Norbury. H. M. Wakley, 11 Adam Street, E.C.—Six houses, Pollards Hill. H. Elliott, "Rowan," Warwick Road.

**Dudley.**—New town hall and municipal buildings (£40,000).

**Edinburgh.**—Electric lighting installation at South Gray's Close and Fountainbridge washhouses. City Electrical Engineer. February 28th.

Electric lighting at Castle Hill school. Consulting Engineers, Crawford & Cumming, 51 George Street.

**Harrogate.**—New school in Skipton Road.

**Trimdon.**—The Paris Council invites tenders for electric lighting Trimdon Grange and colliery villages. Town Clerk.

#### Miscellaneous

**Brighton.**—Tenders are invited for overhead equipment of railless trolley system, including four double-deck railless cars. Tramway Manager. February 23rd.

**Bolton.**—Twelve months' supply of various stores for Tramways Department. General Manager. February 23rd.

**Great Central Railway.**—Twelve months' supply of electrical fittings, cable, &c. Stores Superintendent, Gorton, Manchester. March 3rd.

**Greece.**—Two electric cranes of 10-tons and 6-tons lifting capacity respectively, for docks at Piraeus. March 28th. President of Harbour Board.

**London: Islington.**—Twelve months' supply of electrical stores for Guardians. Clerk, St. John's Road, Upper Holloway. February 27th.

**H.M. Office of Works.**—Tenders are invited for the execution of electric-bell hangers' work in the London district for

three years. March 12th. (See advertisement on another page.)

**L.C.C.**—Twelve months' supply of electrical stores for the Asylums Committee. Clerk to Committee, 6 Waterloo Place, S.W.

**Macclesfield.**—Twelve months' supply of electrical stores for Cheshire County Asylum.

**Newport (Mon.).**—Twelve months' supply of electrical stores. Clerk, Queen's Hill. March 3rd.

**South Wales.**—The Bedwas Navigation Colliery Co. require a twelve months' supply of electrical stores. March 5th.—Twelve months' supply of electrical stores. Particulars from Manager, Aberaman Offices, and tenders to Powell Duffryn Steam Coal Co., 101 Leadenhall Street, London.

**West Ham.**—The Guardians invite tenders for a twelve months' supply of electrical fittings. Clerk, Union Road, Leytonstone. March 5th.

### TENDERS RECEIVED AND ACCEPTED

**Burnham.**—The tender of the Burnham Electric Light Co. has been accepted at £39 17s. for the electric lighting of the town hall.

**London: L.C.C.**—A tender by the Brush Electrical Engineering Co. at £437 has been accepted for four car traversers at the Abbey Wood car shed extension, and one by the British Westinghouse Co. for electrical equipments at £184.

**Yarmouth.**—Twelve tenders were received for a 600-kw. turbo-alternator, and that of the lowest—The Brush Electrical Engineering Co., at £3,358—has been accepted.

### APPOINTMENTS AND PERSONAL NOTES

A long discussion took place at the Sheffield Corporation meeting on Wednesday last week with regard to a proposal of the Electric Light Committee that the salary of Mr. S. E. Fedden, Manager of the electricity undertaking, should be increased from £800 to £900 per annum, with a further increase of £25 per annum up to £1,000. There was a good deal of opposition, and eventually it was decided to increase Mr. Fedden's salary from £800 to £900 per annum, leaving the further increase for subsequent consideration.

Mr. F. Ayton, Borough Electrical Engineer at Ipswich, has had his salary increased by £100 per annum for the years 1914 and 1915, at which date his present agreement with the Corporation expires. The question of his future salary will presumably then come up for further consideration.

An electrician is required for a large brewery near London. (See advertisement on another page.)

There is a vacancy for an electrical tester in H.M. Dockyard, Devonport. (See advertisement on another page.)

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £67 5s. to £67 15s. (Last week, £68 to £68 10s.)

**Agency.**—George Ellison (Warstone Lane, Birmingham) has appointed Nathan & Allen (Queen Anne's Chambers) as his London agents.

**Liquidations.**—The Kent Electric Power Syndicate is to be wound up voluntarily. Mr. F. A. Walker, 2A Railway Street, Chatham, is liquidator.

**Bankruptcies.**—W. N. Berry and H. Bamber, trading as W. N. Berry & Co., Electrical Engineers, 32 Queen Street, Manchester, have been adjudicated bankrupts.

The first meeting of creditors was held yesterday at the official receiver's offices, Byrom Street, Manchester, and the public examination will take place on February 20th, at 10 a.m. at the Court House, Quay Street, Manchester.

An order has been made for the discharge in bankruptcy of J. G. M. Hilton, Electrical Engineer, 103 Exchange Buildings, Birmingham. Digitized by Google



## LOCAL NOTES

**Ayr: Power Contracts.**—The old question of whether or not it is profitable to enter into large power contracts at low prices has been agitating the minds of several people in Ayr, with the result that Mr. J. F. C. Snell has been called in to advise as to the proposed contracts with two large firms, the terms of which, however, have not been disclosed. Mr. Snell, who is also reporting fully upon the best method of extending the power-house, has expressed himself in agreement with the terms offered in these two contracts.

**Bo'ness: Electricity Works Purchase.**—The Council has the option of taking over the electricity works of the National Electric Construction Co. early next year, and the Company has suggested that if the Council is not desirous of doing so, an arrangement might be made by which the agreement should be renewed for a further twenty or twenty-five years, or alternatively that the undertaking should be handed over to the Company completely. The Council has, however, not agreed to take advantage of the position next year, and has decided to delay consideration of any alteration in the agreement until the next opportunity for purchase, which occurs four years hence.

**Dudley: Electricity Undertaking.**—The Council's electric supply undertaking has now been handed over to the Company whose offer to purchase created so much controversy last year.

**Dundee: Manufacturers' "Combine."**—The Electricity Committee last week discussed the question of the cost of generating plant in relation to the necessity for purchasing converting plant, boilers, and coal-handling machinery for the Carolina Port power-house. The Convener suggested that the Engineer and himself should be empowered to negotiate privately for the plant, as in consequence of the "combine" of manufacturers this was believed to be the cheapest course. It was recalled that some years ago a similar trouble had arisen in connection with cables, and better prices had been obtained for equally efficient cable from the Continent. The suggestion to negotiate privately was agreed to by the Committee.

**Hove: Purchase of Electric Supply Co.**—A loan of £180,000 at 4 per cent. has been taken up with the Liverpool Corporation in connection with the purchase of the Hove Electric Lighting Co.

**Lowestoft: Arc Lamps v. Half-Watt Lamps.**—The Electric Lighting Committee has decided to proceed with a scheme for the installation of ten flame arc lamps for the lighting of the Lower Esplanade, in preference to the adoption of half-watt lamps. This decision was come to on the advice of the Electrical Engineer, who reported that he wished to make experiments as to the life of half-watt lamps before definitely recommending them. In the meantime the old arc lamps on the Esplanade are inefficient, and a change is necessary at once.

**Plymouth: Public Lighting.**—A proposal by the Electricity and Street Lighting Committee to light the Embankment by electricity by means of lamps 100 yds. apart, at a cost of £437, has been referred back for consideration of the comparative cost of electricity and gas.

**Rochdale: Electricity Extensions.**—Some time ago a L.G.B. inquiry was held concerning a loan of £68,500 for electrical extensions, and the Corporation, in anticipation of the necessary consent being given, let provisional tenders. Before granting the loan, however, the L.G.B. has now asked for particulars of the contracts which it is proposed to give and which amount to some £47,000. As all this is considerably delaying the progress of the extension, and the matter is one of extreme urgency owing to the increased demand upon the plant, the L.G.B. has been asked to expedite matters a little.

**Stirling: Proposed Purchase of Electricity Undertaking.**—Mr. George Balfour's offer of £32,000 for the electric lighting undertaking with certain reductions in the charges and the electrification of the existing horse tramways, does not altogether meet with the approval of the Council, which is advised that an electric tramway system can be constructed for £74,000 with a reasonable certainty of financial success.

**Truro: Electric Lighting.**—The Council has been in communication with the Cornwall Electric Power Co. as to terms for a supply in bulk as against setting up its own generating station under the provisional order granted last session.

The Company offered a contract for twenty-one years, but the Council has now asked for terms for a forty-two years' contract with the option of determining it at the expiration of the fifteenth year or any subsequent seventh year.

**Walthamstow: Supply to Woodford.**—Terms have now been arranged with the Woodford Council for giving a supply of electricity in that district.

**Wimbledon: Charges for Power.**—The charge for electricity for power, heating, and cooking purposes in the Maldens and Coombe district has been reduced from 2d. to 1d. per unit.

**Worcester: Rateable Value System.**—The Electricity Committee recommends that a 15 per cent. rateable value system, plus ¾d. per unit, be offered to consumers. There will be a discount of ¼d. per unit if the quarterly charge is paid before the end of the month following each quarter day.

**Wormit: Electric Supply Undertaking.**—A proposal that the Engineer and Manager of the Alloa Electricity Department be engaged to report upon the condition of the Wormit electric lighting plant was passed at the last Council meeting.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**St. James' & Pall Mall Electric Light Co.**—The ordinary general meeting was held on Tuesday, when the report and accounts were adopted. Mr. W. Leaf, who presided, referred to the fact that Mr. F. J. Walker, the Managing Director and Secretary, has now recovered from his very serious illness. A 12 per cent. dividend on the ordinary shares was sanctioned, as compared with 10 per cent. last year. The amount placed to depreciation is £18,574, compared with £13,500 in 1912. There are at present in hand plant extensions involving a capital expenditure of about £60,000.

**London Electric Supply Corporation.**—The dividend on the ordinary shares for 1913 is increased from 2½ to 3 per cent., as compared with 1912.

**Yorkshire Electric Power Co.**—At the meeting on Tuesday the report and accounts given in our last issue were adopted. The Chairman, Mr. A. G. Lupton, pointed out that the profit for last year was sufficient to pay a small dividend on the ordinary shares, but in view of the rapid growth of the Company, and of the need to deal with the second mortgages on the undertaking, the directors considered this would be unwise. Dealing with the Company's Bill which is to come before Parliament this session, special reference was made to Clause 3, which enables the Company to supply in detail in districts where there is at present no electric lighting provisional order. He explained that the object of this is merely to give such districts a supply of electricity without in any way prejudicing the rights of the local councils to take out provisional orders subsequently, if they desire to do so. In only a few cases are these small local councils opposing, but for some reason the larger corporations have petitioned on this particular clause, notwithstanding the fact that it does not apply to them, as they already have special protection under the Company's previous Acts.

**Electrical Distribution of Yorkshire.**—A 6 per cent. dividend on the ordinary shares is recommended for 1913, after adding £1,000 to reserve, the carry forward being £636. Two additional provisional orders have been acquired during the year.

**Mather & Platt.**—The net profits for 1913 were £164,524, and a dividend at the rate of 10 per cent. per annum is recommended on the ordinary shares, together with a bonus of 5 per cent., both free of tax. £50,000 have been transferred to reserve, and £40,030 carried forward.

**W. T. Henley's Telegraph Works.**—A dividend of 15 per cent. on the ordinary shares has been recommended for 1913, in addition to a bonus of 5s. per share.

**Ascot District Gas and Electricity Co.**—A dividend at the rate of 6 per cent. for the December half-year is declared, after setting aside £300 for reserve and carrying forward £1,045.

**Companies Struck Off Register.**—The following have been struck off the register of joint stock companies: Electric Power Plants; Titan Electric Co.

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# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 374 [VOL. X., No. 9]

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THURSDAY, FEBRUARY 26, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL and PUBLISHING OFFICES: 308-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

NOTICE of several motions to reject the London Electric Supply Bill on second reading in the House of Commons has been given. The L.C.C. petition against the Bill also seeks the rejection of it entirely. (Page 112.)

AN illustrated description of the Siemens automatic telephone exchange system contains particular reference to an equipment at King's College Hospital, and reference is also made to the 121-dial electric clock system there. (Page 113.)

ELECTRIC welding was discussed at a recent meeting of the Institution of Mechanical Engineers, when Mr. T. T. Heaton read a Paper describing a number of systems of welding. (Page 114.)

A PAPER by Mr. T. Ferguson, read before the Manchester and Birmingham Local Sections of the Institution of Electrical Engineers, described the leading features of several electric train-lighting systems. (Page 115.)

A REPORT recently issued by the International Electrotechnical Commission contains the recommendations regarding the standardisation of symbols agreed to at the Berlin Congress. (Page 115.)

THE advantages and disadvantages of the magnetite arc lamp are discussed in our Questions and Answers columns. (Page 116.)

A NUMBER of interesting points regarding the control equipment of electric locomotives were raised by Mr.

F. Lydall in his Institution Paper read at Birmingham last night, and to be discussed in London to-day. Two Papers, read at the last meeting of the Institution of Civil Engineers, on electric railway matters, one by Mr. W. Willox on rail steels, and the other by Mr. S. Sellon on corrugation. (Page 117.)

A FURTHER delay in the hearing of the action for infringement of the Marconi patent No. 7,777 of 1900, brought by the Marconi Co. against the Helsby Wireless Telegraph Co., will result from the application by the Helsby Co. in court on Monday, under a section of the Patents Act, for the appointment of an "assessor" to help the judge on technical matters. Who the assessor will be is not yet announced. (Page 117.)

A PATENT by A. Muirhead and R. H. Edgar, relating to the construction of siphon-recorders, expires during the current week after a full life. The specification of a Siemens' Patent of 1904 for the manufacture of drawn-wire filaments has been amended. Among the specifications published by the Patent Office last week is one by the B.T.-H. Co. dealing with the preparation of tungsten, suitable for use in the manufacture of drawn filaments. Two other specifications deal with wireless transmitting circuits, in which rotary disc dischargers and "split" and working condensers are used. These patents are in the name of G. Marconi. Another important patent, by W. Rübel, is for a soft good dynamo iron, containing aluminium and silicon. (Page 118.)

A PAPER by Mr. J. C. Hutton read recently in Wolverhampton outlines the principal features of the various dynamo systems of lighting motor-cars. (Page 119.)

NEW examples of fittings for half-watt lamps and examples of installations of these lamps are illustrated in our Trade Section, which also contains descriptions of an electric pump and some accessories for conduit wiring. (Pages 119 to 122.)

NEW generating plant or cable is required at Basingstoke, Burton-on-Trent, Bexhill, Rotherham, and by the Lancashire & Yorkshire Railway Co. Electrical stores, including meters, cable, arc lamp carbons, &c., are required by a number of municipal electric supply departments. (Page 123.)

THE Hornsey Council is only prepared to support the I.M.E.A. Bill if wiring work is carried out through contractors.—Many hired radiators have been returned at Southampton since the charge was increased.—Large sums are to be taken from electricity profits for relief of rates at Brighton and Swansea against the wishes of the Electricity Committees. (Page 124.)

SATISFACTORY results for 1913 are shown by Bruce Peebles & Co., W. T. Glover & Co., and the British Electric Transformer Co. A 10 per cent. dividend is recommended by the latter. (Page 124.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, FEBRUARY 26TH.

*Institution of Electrical Engineers.*

8 p.m. "Motor and Control Equipments for Electric Locomotives," by F. Lydall. The same author's previous Paper on Electric Locomotives will also be discussed.

FRIDAY, FEBRUARY 27TH.

*Institution of Electrical Engineers: Manchester Section.*

7 to 7.15 p.m. Annual Dinner at Midland Hotel.

SATURDAY, FEBRUARY 28TH.

*Royal Institution.*

3 p.m. Afternoon lecture, I., by Prof. Sir J. J. Thomson, F.R.S., on "Recent Discoveries in Physical Science."

*Association of Mining Electrical Engineers.*

5.30 p.m. Warwickshire and S. Staffs branch. At Imperial Hotel, Birmingham. "Design and Maintenance of Miners' Electric Lamps," by F. J. Turquand.

TUESDAY, MARCH 3RD.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "The Possibilities of Electric Traction on Railways," by J. L. Moffett.

*Institution of Electrical Engineers: Scottish Students' Section.*

7.30 p.m. At Royal Technical College, Glasgow. "The Maintenance and Repair of D.C. Plant," by H. A. Stewart.

*Wireless Society of London.*

8 p.m. At Institution of Electrical Engineers. Debates on "The Design of Receiving Apparatus with Particular Respect to the Size of Coils and the Nature of their Winding," and "The Relative Importance of Constructional Features of Telephones."

WEDNESDAY, MARCH 4TH.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. Discussions on "Synchronous Motors v. Induction Motors" and "The Prospects of Electrical Engineers."

## The London Electrical Engineers.

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(TO-DAY) THURSDAY, FEB. 26TH, C. Co. FRIDAY, FEB. 27TH, D. Co. MONDAY, MARCH 2ND, A. Co. TUESDAY, MARCH 3RD, B. Co., Tech. Inst., 7 to 10 p.m., Min. Range Practice, 7 to 9 p.m. WEDNESDAY MARCH 4TH.—Recruits. Infantry Drill, 7 to 8 p.m. Tech. Inst., 8 to 10 p.m.

## ELECTRICITY SUPPLY IN LONDON

THE London Electric Supply Bill was down for second reading in the House of Commons on Monday, but has been deferred until Monday next. It is interesting to note that notices have been given to move on the second reading that the Bill be read a second time "upon this day six months," by Mr. Lough, Mr. Radford, Mr. Wiles, Mr. Dickinson, Sir Stephen Collins, and Dr. C. Addison, all of whom are Metropolitan Members.

The Parliamentary Committee of the London County Council has reported with regard to the Bill. After briefly setting out the present position with regard to the London electric supply companies, and the object of the Bill, the petition which the Council has lodged against the Bill is outlined. This points out that the Council is fully alive to the complications and difficulties now existing in regard to electricity supply in London, and the importance of the option of purchase vested in it by the London Electric Supply Acts, 1908 and 1910; that with a view to determining as to the best course to be adopted, the Council has appointed a special committee to consider the whole subject; that the committee, with the assistance of eminent expert advice, has already devoted much time and attention to the question, but have not completed their inquiries and are not yet in a position to submit the result of their deliberations to the Council. The petition further states that the Council is at present unable to determine whether or not it will be necessary to place before Parliament proposals for further legislation on the subject, and that it objects strongly to the grant in the meantime of any further powers such as those proposed in the Bill. It is also pointed out that the Bill, if allowed to become law, may prejudice the Council in any negotiations which it may have to undertake as the result of its investigations, and militate against a complete and satisfactory settlement of the important questions now under consideration.

The conference of London Borough Councils, to which we referred in our last issue, has passed a resolution protesting against the Bill unless guarantees be given to municipal undertakings that no action will be taken, apparently by the L.C.C., in connection with loans which will prejudice the development of these undertakings. The resolution also objects to the Bill on the ground that it may enhance the value of the companies undertakings to such an extent that their purchase subsequently will be commercially prohibitive. It is further recommended that the Bill should be opposed by every possible means, and failing a *locus standi* to appear before committees, the local Members of Parliament should be asked to oppose the Bill in the House of Commons. As we have already pointed out, a number of London Members of Parliament have fallen in with this view.

## THE LIGHTING OF PICTURE GALLERIES

AT a meeting of the Illuminating Engineering Society on Tuesday, February 17th, a discussion was opened by Prof. Silvanus Thompson, F.R.S., on the lighting of picture galleries and art studios. His remarks dealt at some length first with daylight illumination, and in turning to artificial lighting he emphasised that an arrangement of lamps which might be good for general illumination was not one which could be adopted for lighting particular pictures. Lamps should be screened, so that there were no interfering reflections from the glass or varnish of the pictures, and must not shine directly in the eyes so as to interfere with the proper viewing of the pictures. Indirect lighting was the extremist way of solving the problem, but although admirable for some purposes, he did not consider it satisfactory in all cases for an art gallery. There always seemed to him to be something wanting if the lighting was only indirect, especially in sculpture galleries, where a great part of the beauty and effect depended on the shadows. In general, lamps in picture galleries and studios ought to be placed so that the main direction of the light was the same as by daylight. The speaker then referred to the great difficulty in obtaining true colour effects by artificial light. The greatest step in advance had been by tungsten filament lamps in special bluish glass globes. Green was the hardest colour to deal with. Mr. A. P. Trotter agreed that artificial and natural lighting should come from the same directions, but in cases where the positions of the windows were bad, the lamps should be arranged to give a better effect. The greatest complexity was given to the colour-matching problem by the fact that daylight itself varied so much. He had done some experimenting on coloured glass screens with the spectroscope, and hoped eventually to find a glass that could be made not only in globes, but in sheets, which would give a better approximation to daylight than could be produced at present. Mr. David Murray, R.A., said that the bluish lamp gave a "fictitious beauty," and Mr. Joseph Pennell characterised them as "nothing but tricks." The latter speaker described a system in use at the Louvre and in Venice, where lamps were mounted at the top of a screen which served primarily to adjust the daylight illumination. The effect was a similar distribution as in the daytime. Mr. V. A. H. Mackinney had paid much attention to the problem of getting uniform or definitely graduated illumination over a surface, and showed screens for the purpose. Mr. Percy Rigland referred to experiments with metal reflectors, but none had given such good results in his studio as whitened canvas. Mr. Thornton referred to the possibilities opened up by intentional inequality in the individual lighting of pictures. Mr. Bush said that cornice lighting should not be confused with indirect lighting from fixtures. With the former, when looking at the higher pictures, there was a tendency for the eye to catch the brightly lighted cornice, with the result that the pupil would close and the picture would not be seen properly, whereas this objection did not occur to the same extent with indirect lighting from fixtures in the centre of the room or behind the observer. He described an installation in America where a long trough was used all along the exhibition with provision for fixing lamps at any point, so that every picture could be treated separately. Mr. Justus Eck deprecated light coming from too many directions at once for viewing statuary. Mr. T. Ritchie, in speaking of colour screens, said that the falling off in efficiency caused by their use was not sufficiently realised. Prof. Thompson, in his reply, referred to the fact that incandescent lamps in coloured bulbs, to give a light approximating to daylight, were now articles of commerce.

## THE SIEMENS AUTOMATIC TELEPHONE SYSTEM

(With Particular Reference to the Telephones and Electric Clocks at King's College Hospital)

WE have had an opportunity of inspecting two examples of Siemens automatic telephone exchanges—one at Messrs. Siemens Bros. & Co.'s own works at Woolwich, and the other at King's College Hospital, Denmark Hill. The now well-known finger-plate dial is used on the subscriber's instrument, and the action of taking the receiver off the hook actuates a pre-selector in the exchange, which connects a free selector circuit to the subscriber's line; the selector connects the line to the connector of the hundred group required, and this is operated by the impulses sent by the calling subscriber, and selects the wanted subscriber's line or the "busy" tone contact. In larger exchanges, of course, intermediate selectors are used, and in smaller exchanges the selector is dispensed with altogether (up to 100 lines), or is replaced by a fifteen-line selector or "discriminator" (up to 200 lines). A pre-selector for ten selector lines is shown in Fig. 1; similar ones are made with contacts for fifteen to twenty-five lines. The arms holding the three sets of wipers are rotated over the contacts by means of a ratchet and pawl worked by an electro-magnet, which receives impulses at the rate of fifty per

magnet for rotating the wiper shaft. At the close of the conversation, the release magnet is operated when the subscriber hangs up, and this allows the wiper shaft to drop to its normal position by gravity. The selectors are similar in appearance to the connectors.

The 200-line exchange of this type has been working satisfactorily at Messrs. Siemens' works for about two years to connect up the various departments, and we were also shown

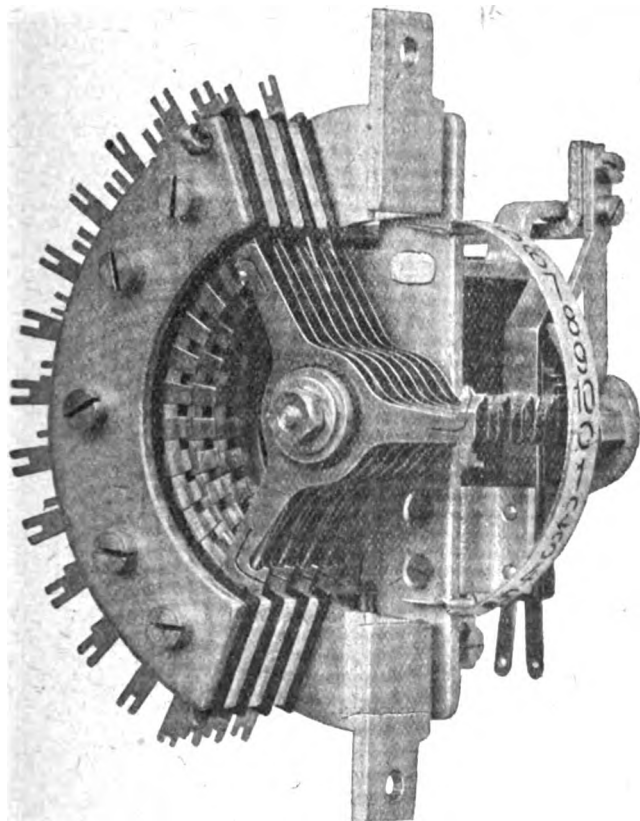


FIG. 1.—THE PRE-SELECTOR.

second from an interrupter or a small A.C. machine as soon as the subscriber removes his receiver and actuates the line relay connected to the pre-selector. As soon as the wipers reach a free selector circuit, current is cut off from the driving magnet, and the pre-selector remains in that position until the subscriber hangs up. As soon as this happens, the driving magnet circuit is again completed and the wiper arm continues its travel to the end of the segment of contacts until it reaches the "off" position. It will be seen in Fig. 1 that there are three arms, each carrying a set of three wipers, and the next one is then ready to be moved on by the driving magnet when another call is received. The design of this pre-selector is the chief feature of the system; it is simple, and there is little in it which can get out of adjustment. Fig. 2 shows the design of the connector. The two bottom banks of contacts are each fitted with five levels of ten contacts each, making 100 in all, for the subscriber's line multiple, and the top bank has ten levels of ten contacts for the corresponding test circuits. The magnet to the right in the upper part of the illustration is the lifting magnet, next to this is the release magnet, and below the latter are seen the two coils of the

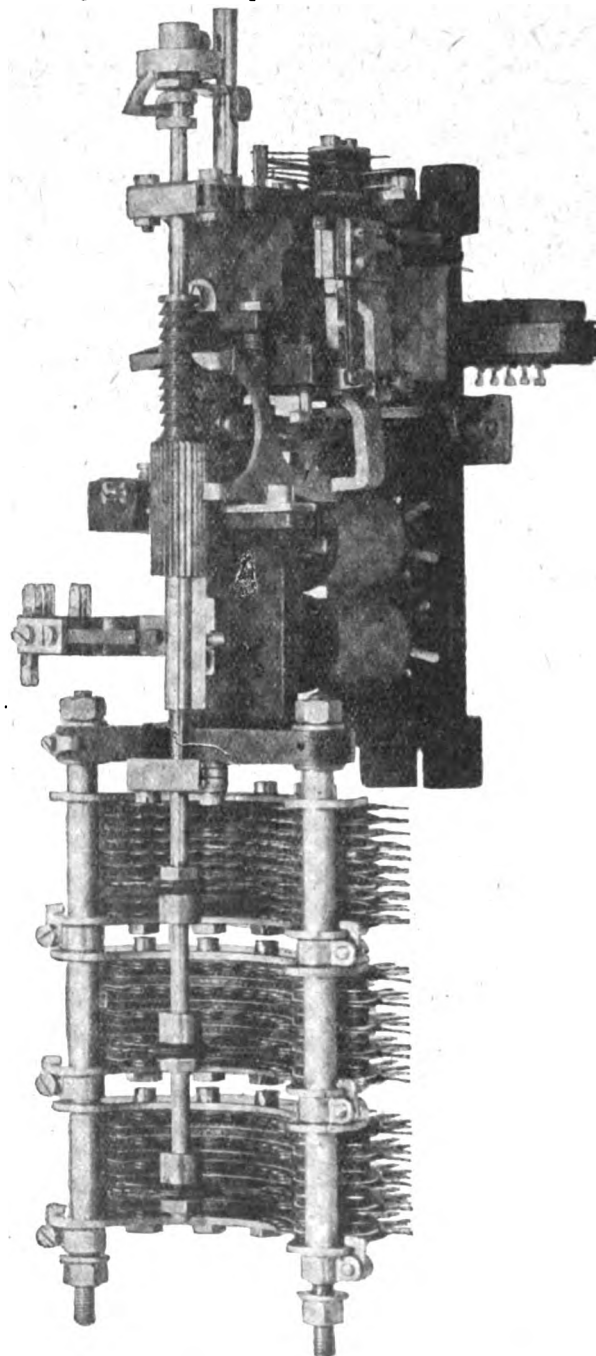


FIG. 2.—THE CONNECTOR.

a neat board consisting of hinged racks fitted in a cupboard with dust-proof shutters, which the firm is shortly introducing for 25 to 50-line village exchanges. In the latter the whole of the connections are made by simple switches of the pre-selector type, which are worked by primary batteries.

The automatic exchange at King's College Hospital has an ultimate capacity of 150 lines, of which ninety are at present working. To save current, the motor-driven interrupter for the pre-selectors is only in operation when a call is in progress. As soon as the telephone of any station is taken off its switch-hook, the motor is started automatically by a relay. The exchange occupies very little space and the



racks are placed at 3 ft. centres. Current is provided by two small 60-volt batteries, which are charged from the Hospital's electric lighting plant.

Reference may be made here to the wiring arrangements in connection with the telephones, bells, annunciator boards, and clocks at King's College Hospital, although they are not necessarily a part of every automatic telephone installation erected by Messrs. Siemens. Multiple cables with 10-lb. conductors and twin cables with  $12\frac{1}{2}$  lb. conductors are employed. The copper wires are enamel-insulated, then covered with paper saturated with

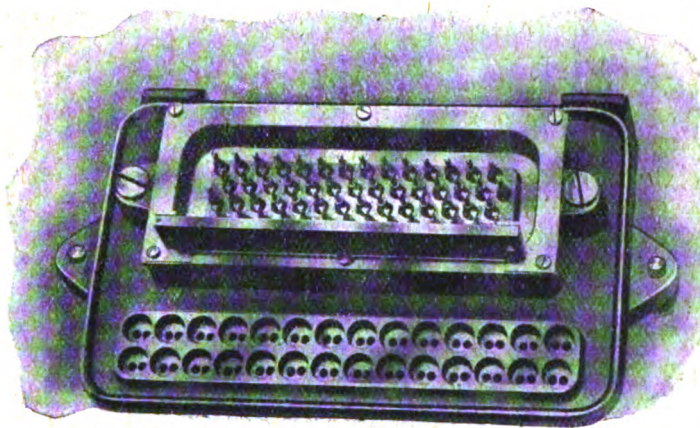


FIG. 3.—DISTRIBUTING BOX: TOP COVER REMOVED.

beeswax and lead-sheathed. All the circuits (telephones, bells, and clocks, with ample provision of spares) run together to a main board, with a capacity for 600 pairs, in a central part of the building, and are connected up by cross-connecting wires neatly arranged. From this main board multiple cables are taken to distributing boxes outside the building. Fig. 3 is a view of one of these boxes with the top cover removed to show the terminals and the inlets for the twin wires, and Fig. 4 is a section of a smaller box, which explains the method of connection. The twin wires to the instruments are led in through the window frames, and are buried under the plaster in the room—a thing much to be desired in hospital work to prevent possible

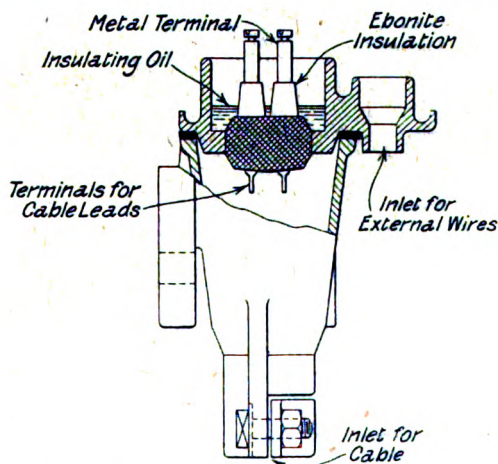


FIG. 4.—SECTION OF DISTRIBUTING BOX.

accumulation of dust. These wires run straight to the instruments; there are neither pot-heads nor window terminals.

The electric clocks are an interesting feature of the installation. There are in all 122 clocks. A master clock is placed in the telephone switchroom, and sends out impulses once a minute to the remaining clocks, which are of high resistance (2,400 ohms each) and connected in parallel. The master clock is electrically wound, and the winding gear is operated every minute, but the winding magnet is so wound that it fails to operate, due to low voltage of the battery, long before the secondary clocks. It does not stop, however, as it is a two-day clock; but the weight descends in the ordinary way, and after two minutes a warning bell circuit is closed and the batteries can be recharged before the secondary clocks cease to operate. The clocks are worked at 26 volts from the same battery as the telephones. They

are grouped in sets of seven on a circuit, and each circuit starts from the switchroom and is protected there by a fuse. An impulse counter, similar to a telephone meter, is connected across each circuit there, and if any circuit is out of order this is seen by the reading on its counter being different to that of the others. When the circuit is put in order again, the clocks on it are reset from the switchroom by a key which is pressed to send impulses to the circuit in question until the counter shows the same reading as the others.

The whole installation at King's College Hospital was erected under the supervision of the Consulting Engineers, Messrs. Kirkland & Capper, and the architect, Mr. W. A. Fite.

## ELECTRIC WELDING

A PAPER entitled "Some Modern Methods of Welding," by Mr. T. T. Heaton, was read before the Institution of Mechanical Engineers on February 20th. The author commenced by summarising the chief features of the leading electrical systems. In the Benardos arc system, which uses continuous current at about 90 volts from a special compound-wound generator, the work itself forms the positive pole of the arc, and a rod of carbon in an insulated holder in the hand of the operator is the negative pole. Several arcs, each carrying 200 to 500 amperes, can be worked off one machine in parallel. In the Zerener method, the two carbons are in the same holder, and a magnet deflects the arc towards the work. In the Strohmer-Slaughter system, which can be worked by alternating current, the parts to be welded are placed in juxtaposition, and an electrode, consisting of a soft iron rod covered except at the ends with a flux, is laid along the welding line. Contact is made between the work and one end of the electrode, which fuses by a series of arcs along the welding line, melting the electrode into the work and coating the weld with a vitreous flux which prevents oxidation, but flakes off when the metal cools. Another class of system is electric contact welding, where the pieces to be welded are pressed together in a special machine, and an alternating current with a density of 16,000 to 20,000 amperes per sq. in. at 2 to 4 volts is passed through the joint, and the parts pressed further together. A similar method with rather lower currents is employed in "spot" and "roller" welding. In the former, which is for sheet and similar work, the work is laid upon a fixed copper contact piece and a movable electrode is pressed immediately over it. Current is then switched on, and, in passing through the work, heats it and makes the weld. A series of such spot welds, like a row of rivets, can be made practically continuous by the spots overlapping one another. In the roller system, the work travels between electrodes in the form of rollers, and a continuously welded line is produced. In the Pontelac modification of the spot system, a small metal disc is placed between the pieces to be welded, and is crushed into the weld. It is claimed that the heat is better concentrated by this method.

The author then outlined the procedure in oxygen gas blow-pipe welding, and in comparing the various systems said that he regarded electric arc welding and oxy-acetylene welding as the two systems most suitable for general application and the rest for special work. For some classes of work arc welding was superior, but for thin work there was more risk of running the metal by the arc owing to its higher temperature, which was about 7,500° F. against 6,000° F. of the oxy-acetylene flame. In his opinion electric heat must be more effective because it was produced within the work itself, whereas the heat of the gas flame was applied entirely from outside. Where the work was suitable arc welds could be made much more quickly than acetylene welds. Arc welding was used successfully for filling up blow-holes, &c., in steel castings. It was wrong to say that electric welding hardened the metal by filling it with carbon from the electrode. On the contrary, the arc burned out all impurities, including carbon, and left purer iron in the weld. A large number of cases of welded work were described and illustrated in the Paper.

Mr. G. N. Shawcross, in the discussion, said that many people would have tried contact welding to a greater extent if it did not require a special single phase circuit. Mr. T. Clarkson had been disappointed with the results of oxy-acetylene welding, and mentioned the Thermit process as having the same advantage as the electric resistance method in that the temperature was gradually brought up to the welding point when the two pieces of metal were forced together. The electric resistance method was, in his opinion, the best, the most controllable, the least



likely to injure the material, and gave the most uniformly satisfactory results. Mr. D. Richardson and Mr. A. Wechsler defended the acetylene process, and the former thought that there was a loss of mechanical properties in electrically welded joints. Mr. B. J. N. Willcox had not been very successful with the Benardos process for marine repairs, but spoke highly of a modification of the method worked by the Anglo-Swedish Co., in which a pencil of pure iron was used instead of the movable carbon electrode. He had used this with great success on large boiler work. Mr. E. Adler (A.E.G. Electric Co.) spoke of the use of special constant-current generators for portable Benardos apparatus, and with regard to resistance welding said that this was primarily introduced for the welding of materials to edges and cross-sections particularly in copper. The system had made great advances in the Birmingham district for motor bicycle and similar parts and outfits, for 200 to 300 kw. were now made for welding railway points, switches, and other heavy work. Mr. W. H. Patchell mentioned a rail welding system with a carbon negative pole used by the Tudor Accumulator Co., and said that the beauty of the resistance method was that it did not put anything into the weld. He believed that copper had been welded by the resistance method before iron was tackled, and that some of the cable-makers had been making copper joints by that system for many years.

### TRAIN LIGHTING

A PAPER on Electric Train-Lighting Systems, by Mr. T. Ferguson, was read at a meeting of the Manchester Local Section of the Institution of Electrical Engineers on January 27th, and was also discussed by the Birmingham Local Section on the following day. The author quoted the remarks of Major Pringle after the Aisgill disaster, when he urged upon railway companies the desirability of employing electricity as their standard illumination. The simplest method was the "head on" system practised to a limited extent in America, where a small generating plant is carried on the locomotive, and mains are run along every vehicle. This, however, entailed disadvantages which were overcome by the systems with axle-driven dynamos, batteries, and regulating gear, with the coaches either forming individual units or made up into block trains with one lighting plant. Mr. Ferguson outlined some of the conditions that should be met by a good system, and discussed generally the *pros* and *cons* of the single and double battery systems, the latter of which is largely used to overcome the difficulty of the difference between the charging and lamp voltages, but is expensive to instal and to maintain, as well as less efficient than the single battery system. In his opinion, "single-battery systems will have to be much more universally adopted in the future if electric train lighting is to make the progress that is expected of it, as by reducing the number of cells the maintenance and depreciation costs of the equipment are certainly decreased by 25 to 30 per cent." The regulation could be such that the battery is charged either at constant current or at constant voltage. Each system possessed merits, but it would appear that the constant-current system was the more popular; and most of the systems employ a rising characteristic for charging. "Even if constant current represents the extreme of this rising voltage characteristic," writes the author, "yet its simplicity, ease of adjustment, independence of fine adjustment, and faculty for de-sulphating faulty batteries, commend it to the practical railway-lighting engineer, who can feel some confidence that even should the regulation of the dynamo or special regulator become somewhat coarse through unavoidable defects or rough handling, the working of the system will not be very much impaired."

The Paper describes several typical systems in general use. The well-known Stone system has the dynamo so hung that it keeps a practically constant belt tension, so that the voltage of the dynamo is determined by the battery, hence the current cannot increase above a definite amount, or the belt would slip. In other words, the speed of the dynamo does not rise above full-load speed, however much higher is the speed at which the belt runs. In this system the cut-in and cut-out switches are worked by a centrifugal governor. The Leeds Forge Co.'s system also belongs to the "constant current" class, and accomplishes its regulation by the torque required to drive the armature. As the speed increases, the driving torque serves, by means of a cam, to thrust the armature bodily along its shaft in an axial direction from its normal position in the field, the thrust being resisted by a suitable spring. The armature is mounted upon a sleeve which is free to slide on the driving shaft; and it is driven by a pin on the sleeve provided with a roller that works in a spiral cam-shaped groove cut in the shaft. This pin, when the shaft is rotating, bears against the side of the slot and so causes the armature to rotate with the shaft.

Mather & Platt adopt what is practically a constant-current system and use Dr. Rosenberg's self-regulating generator. They usually employ the double-battery method. Another constant-

current example is the "D.L." system of the Consolidated Lighting & Heat Co., U.S.A., adopted by Vicars, Limited. The dynamo is shunt-wound, and when the direction of motion is reversed the polarity is maintained by a reversing brush rocker. The current is kept constant by a solenoid-operated automatic rheostat. A single battery is used, and the difference between the dynamo and lamp voltages is taken care of by another solenoid-operated automatic rheostat. The next system to be described was that of the Tudor Accumulator Co., which is also a single-battery system on the constant-current principle. Particulars of this appeared in *ELECTRICAL ENGINEERING*, Jan. 22nd, page 50. The Silvertown system is a double-battery system more or less similar to the Stone system, except that regulation is not accomplished by the slipping of the belt, but by reverse-compounding coils, which carry the charging current to the battery. A series diverter is provided to adjust the output of the dynamo in the usual way. The switches are operated by a centrifugal governor.

Messrs. Brown, Boveri & Co. adapt their well-known voltage regulator for use with their train-lighting system. The main point in their arrangement is that they provide compound windings on their regulator, so that the battery charging-voltage is not held constant, but gradually rises as the battery becomes charged. The Dalziel system in its latest form employs a special exciter on the dynamo shaft for voltage regulation, and is also a pure constant-voltage system. In another, the Grob constant-voltage system, the dynamo rises at the same voltage as the lamps, and the battery receives its current through a booster.

### THE STANDARDISATION OF SYMBOLS

THE report of the International Electrotechnical Commission on symbols for use in electrotechnics has now been published, and contains the decisions arrived at at the Berlin meeting of the Commission, when delegates from twenty-four nations were present. A certain number of rules of principle relating to electrotechnical symbols generally are given, together with a list of thirty-six symbols. A number of signs for the names of units and a few mathematical rules and symbols commonly employed by electricians are also included. The complete report is obtainable for 2s. 1d., post free. It is noticeable that the Commission desires to avoid the use of Gothic type, and confusion between Roman and italic characters. Instantaneous values are to be represented by small letters, and initial or constant values by capitals. Maximum values are to be distinguished by the suffix *m*, and Greek letters are to be reserved for angles and dimensionless or specific quantities. Script letters are only to be employed for magnetic quantities. Among the symbols to which attention may be drawn are the proposed use of *A*, *W*, and *P* respectively for work, energy, and power; and  $\omega$  for  $\frac{2\pi}{T}$  (where  $\tau$ =period); *D* for electrostatic flux

density, and *X*, *Z*, and *S* respectively for reactance, impedance, and reluctance. Intensity of magnetisation is to be denoted by *J*, as *I* is already appropriated for current. We are forbidden to use our old friend  $\Omega$  for the megohm, and instructed to write *kW* instead of *kw*. for kilowatts. It should also be mentioned that the Commission will recommend the International Congress on the Applications of Electricity, to be held in San Francisco in 1915, to adopt the name "Siemens" for the unit of conductance.

**The Electrical Trades' Benevolent Institution.**—Sir David Salomons has accepted the position of President of this Institution, which became vacant on the death of Sir William Preece. The year-book of the Institution has just been published, containing the Committee's report and accounts, and reports of the annual meeting and festival dinner, together with lists of subscribers, &c. The progress last year appears to have been satisfactory, and the total amount now invested is £4,920. A larger sum was invested during last year than in any previous year. The total of subscriptions, donations, and other sources of income was £1,362. Grants were made amounting to £153, and expenses absorbed £247.

**The Old Centralians.**—The annual dinner held on Saturday last was very successful. Dr. Moody, the President, proposed the toast of "The College," which was replied to by Prof. W. E. Dalby. Mr. G. S. Lamert toasted the "Old Centralians," and Mr. Maurice Solomon responded. Prof. M. O. Forster gave the health of the guests, and Mr. H. Hirst acknowledged this on their behalf. Short speeches were also insisted on from Prof. Armstrong and Prof. Unwin, who were present.

**Wolverhampton and District Engineering Society.**—At a meeting of this Society on Friday last, Mr. C. E. C. Shawfield, the Chairman, gave his Presidential Address on Electricity and Gas, and Mr. F. S. Grogan (British Electric Transformer Co.) gave a lecture and demonstration entitled, "The Cooking Problem—Why Electricity is Winning," which was followed by a discussion opened by Mr. S. T. Allen, Borough Electrical Engineer, Wolverhampton.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,380.

How does the rating of pipe ventilated motors compare with that of totally and semi-enclosed machines? In the smaller sizes, say 10 h.p. at speeds from 600 to 1,000 r.p.m., how is the air circulation effected?—"E. W. A."

(Replies must be received not later than first post, Thursday, March 5th.)

### ANSWERS TO No. 1,378.

What are the salient features of the magnetite arc lamp, and why does it not find so much favour in this country as in U.S.A.?—"KINK."

The first award (10s.) is given to "T. H. S." for the following reply:—

The magnetite arc was developed by Dr. Steinmetz, and consisted in its original form of an arc burning between a positive electrode of copper and a negative electrode of magnetite (ferric oxide), titanium oxide, and chromium oxide. The light comes from the arc itself, as in the flame arc, though it is believed that a projection of electrons takes place, instead of volatilisation of material, as in the flame arc. In order to take advantage of the luminous tip on the negative electrode in the later developments, this electrode was placed above the copper, instead of the reverse arrangement in the earlier form of arc. This necessitated a composite positive electrode, so that the arc should not be interrupted by a non-conducting layer of copper oxide; better ventilation had also to be provided to remove oxides thrown on to the upper electrode. The functions of the three oxides in the negative electrode are as follows: The titanium oxide is the main light-producer. The magnetite makes the mixture a conductor when cold. The chromium oxide retards the volatilisation of the other constituents, similar to the carbon powder in the core of a flame-cored or ordinary-cored carbon. The oxides are mixed and compressed in thin iron tubes. The arc is practically white, and is usually long, about 1 in. The arc volts may be 60/85. The candle-power is of the order of 250 to 400 at 0.6 to 0.8 watts per candle.

The characteristic curves are similar to those of the ordinary open-type arc. An equation:—

$$V = 33 + 24.5l + \frac{25 + 140l}{A}$$

where  $V$  = volts,  $A$  = amperes,  $l$  = length in mm., has been determined, which is similar to that found for ordinary carbons by Mrs. Ayrton.

The great advantage of the magnetite arc is the long life

of the electrodes, which do not, of course, burn in the air. It is for this reason that it finds favour in the United States, where labour is dear, and arc lamps are often placed at long distances apart, which renders continual trimming a disadvantage. Formerly the enclosed arc was much used in America; but the magnetite arc has a much better efficiency and a longer life—approximately 150 hours against 100 hours of the enclosed lamp. In this country, where labour is cheaper and arc lamps mostly crowded together in towns, the still more efficient flame arc is usually preferred.

The second award (5s.) is given to "E. V. A.," whose reply is given in slightly condensed form below:—

The magnetite lamp is suitable for the lighting of large open spaces where a cheap general illumination is required. It is a metallic arc burning pure commercial copper of large section (about  $1\frac{1}{4}$  in. diameter by 3 in.) for the positive electrode and black oxide of iron and titanium in the form of fine powder for the negative. This is rammed into a steel tube which burns away with the mixture. At 4 amperes the copper electrode lasts about 6,000 hours and the lower (magnetite stick) 200 hours, so that it is only necessary to insert a new negative at each trim. The light given is pure white, and, in the writer's opinion, is of greater value than flame lamps in sidings where coloured signals have to be distinguished, and on slag tips, as red-hot slag shows up more readily. The illumination curve is flat, with the maximum illumination about  $11^\circ$  below the horizontal. The lamp is provided with a central flue to carry off the fumes and to ventilate the globe.

Magnetite lamps operate at practically the same current and arc voltage as enclosed lamps, which they can replace without alteration of the wiring. Only one globe is required and the electrodes are unbreakable. This is an important feature in places where lamps are roughly handled. The reason that the lamps are not put in in great numbers in this country is on account of the quivering of the arc on low voltages. The writer states, however, that this unsteadiness is not noticed when more than one lamp is installed. These lamps are popular in the United States, where the long-series system is almost universal. When run in series of 25 or 50, the arc is much more tenacious and steady than when run singly on 100 volts, or two in series on 200 volts.

A good reply has also been received from "M. M.," who gives the dimensions of the magnetite electrode as  $\frac{3}{8}$  in. diam. by 8 in. long, and insists more strongly than those above on the disadvantage of the fumes given off which necessitates thorough cleaning at every trim. The reply sent in by "Marp" may also be mentioned with commendation. In addition to summarising several points already mentioned, he points out that the lamp can only be used on continuous current circuits.

**Leeds Dinner of the I.E.E.**—A good number of members and friends were present last Friday at the dinner of the Yorkshire section of the Institution of Electrical Engineers, presided over by Mr. W. B. Woodhouse, chairman of the section. The speeches were of an optimistic character. Mr. A. G. Lupton, in proposing the Institution, referred to the remarkable social and commercial changes brought about by the development of the electrical industry. Mr. R. Hammond, in following the president in acknowledging the toast, alluded to a recent visit he had made to South Africa, and urged that every coal mine in Yorkshire should follow the example set by the gold mines in the Rand, and adopt electric winding. Out of 60 of the Rand mines, 48 were worked electrically, and half of them had electric winding installations. The chairman, in proposing "Our Guests," remarked that co-operation between the chemist and the electrical engineer would enable coal and agriculture to be brought together. It would get rid of that bane of agriculture—smoke—and would provide a useful and economical source of power for all farming operations. Prof. Charnock, in giving "The Electrical Industries," predicted that in the near future we might look for some interesting developments in regard to the utilisation of waste gases and electrification of railways. Mr. H. H. Wright, vice-chairman of the section, responded.

**International Electrical Congress.**—The following British engineers have been appointed honorary members of the International Committee on Congress Organisation in connection with the International Electrical Congress which is to be held in San Francisco next September: Mr. W. Duddell, Mr. A. Siemens, Dr. W. T. Glazebrook, Col. R. E. Crompton, Mr. C. le Maistre, Lord Rayleigh, Dr. G. Kapp, Sir J. J. Thomson, Dr. S. P. Thompson, Mr. W. M. Mordey, Dr. J. A. Fleming, Sir Charles Parsons, Sir Oliver Lodge, and Dr. S. Z. de Ferranti.

## ELECTRIC TRACTION NOTES

The Paper by Mr. F. Lydall on "Motor and Control Equipments for Electric Locomotives," read before the Birmingham Local Section of the Institution of Electrical Engineers last night, and to be discussed at to-night's London meeting, is supplementary to his previous Paper on electric locomotives already published in this Journal (see *ELECTRICAL ENGINEERING*, November 13th, 1913), with which it will be discussed. Dealing first with motor equipment, the author pointed out the influence on the motor capacity of gauge, electrical system, voltage, method of transmission, and forced ventilation. The restrictions of gauge were of less importance with coupling-rod drive than with geared motors; polyphase motors made a good showing as regards size for their power, but single-phase motors were undoubtedly more bulky than those for continuous current; forced ventilation resulted in a great gain in output. Turning to control equipment, Mr. Lydall showed how the difference in the ratio of adhesion weight to total weight in locomotives, as compared to motor-cars, had a marked influence on the control system. If the steps were too far apart, skidding might take place and prevent the next being reached, especially when starting on gradients. The number of steps required depended on the torque speed characteristic of the motor. The irregularity in effort due to the controller steps could be got rid of by applying a continuously varying voltage from a motor-generator with D.C., or an induction regulator with A.C. The latter could be comparatively small, and being interlocked with the controller, could simply bridge over the gaps between the auto-transformer tapplings. There was sometimes difficulty in avoiding shock in passing from series to parallel, but this was largely obviated by the bridge system, which was, however, difficult of application with more than two motors. More resistance steps were required with the series than with the parallel connection. Interesting details of resistance- and control-gear construction were given, with diagrams of control connection. Multiple unit control was rarely necessary on locomotives, so that the reversers, main circuit breakers, &c., need not be actuated by remote control. In the United States, however, the reverser was sometimes replaced by a series of contactors. On A.C. locomotives, oil circuit breakers similar to those employed in central stations could be used. Automatic acceleration control was of considerable advantage, especially in goods locomotives. Induction regulators had to be of very strong construction, as the mechanical forces were very heavy at starting, and on short-circuit. In some cases motor-driven drum-type controllers were used instead of a contactor system; but they had the disadvantage of being slow in action. In general auxiliary motors on locomotives should be as few as possible.

Two Papers dealing with electric railway rails were read at the Institution of Civil Engineers last Tuesday. In the first Paper Mr. W. Willox explained that the reduction of the life of rails in tunnels from an average of five to an average of less than three years, and in certain places to less than one year, on the electrified portion of the Metropolitan Railway, had induced him to make tests of the various kinds of steel rails in the curve between Farringdon Street and Aldersgate. Here there were forty-two booked trains on each line per hour in the morning and evening. The conclusion he came to was that open-hearth basic Bessemer rails, manufactured by the late Mr. C. P. Sandberg's process, and under careful supervision, were the most economical. The number of broken rails for the last six years had been very small. The wear after five years was about  $\frac{1}{8}$  lb. per yd. The second Paper, which was by Mr. Stephen Sellon, was entitled "Rail-Corrugation and its Causes." The author said that corrugation was due to the failure of the rail-table under the stresses imposed upon it. In the corrugations the "crests" had the appearance of cold rolled steel, and were relatively hard and refractory to acid; and that the "hollows" were dull, showed some lateral detrusion and pitting, and were only slightly harder than the body of the steel. He believed that the use of hard rails, i.e., those with a high proportion of carbon, was necessary to resist the corrugating action of the wheels, as well as ordinary wear. A comparatively small increase in the compressive strength of the steel would prevent corrugation. The compressive strength was probably about the same as the tensile strength, as the British standard specification prescribed an ultimate tensile strength of 40 tons per sq. in. If this were increased to between 50 and 60 tons per sq. in., provided that a high

ductility were retained, the destructive stresses would probably be resisted.

At the ordinary meeting of the North Staffordshire Railway Co. last week it was stated that not only is the Company installing track circuit signalling throughout the whole of its system, but that every coach on its lines is now electrically lighted.

It is stated that the Hove Corporation has sanctioned the commercial running of trolley-omnibuses on one route as an experiment.

During the week meetings have been held of the Metropolitan District, the Central London, and the London Electric Railway Companies. As far as the two last-named are concerned, the profits available are less than in the preceding twelve months, mainly due to increased coal costs and improved conditions of the staff. On the other hand, there is a large amount of capital expenditure upon linking up works, which must undoubtedly have a very beneficial effect upon the receipts of the Companies in the future. Very much the same condition of affairs was reported at the annual meeting of the City & South London Railway Co., where there has been a heavy drop in receipts due to surface competition, but the intercommunication scheme between this and the other underground railway companies of London is looked to to bring about an important improvement.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A new development took place on Monday in the action which Marconi's Wireless Telegraph Co. is bringing against the Helsby Wireless Telegraph Co. for infringement of the famous Marconi Patent No. 7,777, of 1900. (This patent expires on April 26th.) Mr. Courtney Terrell, on behalf of the Helsby Co., applied in Court to Mr. Justice Joyce, under Section 31 of the Patents Act, 1907, for the appointment of an "assessor" to assist the Judge in trying the case. The application was granted. Section 31 of the Act referred to reads: "In an action or proceedings for infringement or revocation of a patent, the court may, if it think fit, and shall on the request of either of the parties to the proceedings call in the aid of an assessor specially qualified, and try the case wholly or partially with his assistance; the action shall be tried without a jury unless the court otherwise directs. . . . The remuneration, if any, to be paid to an assessor under this section shall be determined by the court or the Court of Appeal, as the case may be, and be paid as part of the expenses of the execution of the Act." Mr. J. Hunter Gray, on behalf of the Marconi Co., opposed the application on the grounds that no "specially qualified" assessor could be found. Mr. Justice Joyce, however, decided that an assessor should be appointed, and directed the parties to the action to agree on someone, or failing that to apply to him in Chambers. Mr. Terrell suggested that Lord Parker (Chairman of the P.O. Wireless Advisory Committee) might be asked to suggest someone who was qualified. It appears that some considerable time must yet elapse before the case comes on for hearing.

A Local Government Board inquiry will shortly be held with regard to the borrowing by the Hull Corporation of £192,423 for the purchase of the Post Office telephone system in Hull.

The last number of the *Telefunken Zeitung*, a copy of which has been sent us by Siemens Bros. & Co., Ltd., contains, in addition to many items of news, an interesting account of the saving of the *Volturno* by wireless telegraphy, a note on the wireless equipment for the forthcoming Amundsen North Pole expedition, and an article describing the erection of a wireless station in Siam.

A description of the Siemens automatic telephone exchange system appears as a separate article on page 113.

The proposed issue of new stock by the Constantinople Telephone Co., referred to last week, has duly been made. The amount is 200,000 six per cent. obligation bonds at 97.

A Wireless Telegraph Society was formed in Nottingham on Monday evening, when about thirty-five persons were present. Like those in other large towns, this is a society of amateurs. The Secretary is Mr. H. Gill (Premier Road, Nottingham).

The viâ Hanekin route was restored on the 17th inst., and the S. Miguel-Fayal cable on the 18th inst.—The Bagdad-Bassorah line was down on the 19th February, and on the following day the Oran-Tangier cable was repaired.—The Bagdad-Bassorah line was working again on the 20th inst.



# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published Feb. 19th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

1,915/13. **Manufacture of Tungsten for Drawing into Filaments.** B.T.-H. Co. (*G.E. Co., U.S.A.*). This is an improvement on the method of preventing "offsetting" when the filaments are used on A.C., described in Patent No. 18,467/11. A solution of a rare earth compound is incorporated with the tungstic oxide or compound from which the powder for use in the production of the drawn filaments is to be produced. The mixture is heated in an oxidising atmosphere and then reduced. A particular method consists in the use of a solution of thorium nitrate. The patentees state that they do not claim anything described in Patent No. 15,915/06 by Deutsche Gasglühlicht A.-G.

2,918/13 and 2,919/13. **Wireless Transmitters.** G. MARCONI. The first specification, which has two diagrams of connections, relates to an improvement on the transmitter described in specification No. 4,593/07. According to this specification a working condenser was connected to the middle of a split condenser, and charged alternately in opposite directions by means of a rapidly rotating toothed disc. Now a series of working condensers is used. One plate of each is connected to the middle of a split condenser which is in series with a source of direct current, a key, and an inductive resistance, while its two outer plates are connected to two toothed discs, preferably mounted on the same shaft. One half of the split condenser may be short-circuited, and if the inductance of the generator is sufficiently low the other may be omitted. The inductive resistances of the working condensers all act as primaries to the secondary in the aerial. The second patent claims the arrangement of the apparatus, so that each condenser except the last discharges into the next, while the dischargers discharge the condensers in synchronism with the period of the aerial. One figure.

3,445/13. **Dynamo Iron.** W. RÜBEL. A dynamo iron in which the eddy current and hysteresis losses are small, and which is soft and can be rolled without breaking, as well as being, it is said, cheap to manufacture, is obtained by the addition to iron, which does not contain more than 0.5 per cent. of impurities, of an amount of aluminium and silicon not exceeding 3 per cent. of the alloy, and of which the aluminium is between 1.3 and 2 per cent. and the silicon between 0.8 and 2.0 per cent. Boron may be substituted for the silicon and beryllium or calcium for the aluminium.

4,425/13. **Signalling on Tramcars.** R. HEATON. Two differently toned bells are used in independent circuits. There is a push in each circuit, and in one case also a switch which is opened when anyone is standing on the step of the car. This circuit is used to give the starting signal only. Six figures.

7,722/13. **Incandescent Lamps.** T. W. LOWDEN. A good distribution of light in the downward direction is obtained by the use, in combination with an insulating support, of a filament helically encircling it. It is connected to the support by means of looped or twisted branches integral with the lighting portions of the filament. The support may consist of a number of legs. The diameters of the convolutions of the filament may decrease towards the pip. The arrangement is an improvement on that given in Patent No. 1,180/12. Five figures.

8,267/13. **Supplying Power to Tramway and Railway Vehicles.** A. HELFENSTEIN. Contact strips or rails are arranged on the vehicles and power is supplied from a number of fixed points along the track. These are formed by a group of freely hanging contact elements, e.g., chains or metal strips, which come into close contact with the contact rails on the vehicles, without pressure on the contacting members and without any considerable stress on the masts, contact pieces, or vehicle. The vehicle contact rails are grooved or ribbed. Part of the hanging contact element is of iron. Five figures.

8,962/13. **Ovens.** R. WEAVING and the FERRANTI Co. To reduce the thermal capacity of the material forming ovens, they are made of or lined with pure rolled aluminium.

## Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** BROCKIE and JOHNSON & PHILLIPS [*Magazine lamp*] 4,926/13; ENGINEERING & ARC LAMPS and DOWDELL, 8,301/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** HEANY [*Insulating conductors*] 18,517/13.

**Dynamos, Motors, and Transformers:** OTIS ELEVATOR CO. (*Otis Elevator Co.*) [*Hoisting motors*] 3,250/13.

**Electrometallurgy and Electrochemistry:** SOC. GÉNÉRALE DES NITRURES [*Aluminium nitrides*] 11,091/13. CLEMM [*Electrolysis of alkali chlorides*] 21,462/13.

**Heating and Cooking:** K.P.H. SYNDICATE and KRATT [*Liquid heating*] 3,370/13.

**Ignition:** HARDINGHAM (*Mafam Motor Apparate Ges.*) [*Magneto*] 16,566/13; ANSCHUTZ [*Magneto*] 22,527/13.

**Incandescent Lamps:** CANELLO [*Malleable tungsten*] 5,150/13.

**Instruments and Meters:** EVERETT, EDGUMBE [*Thermal*] 3,110/13; KORTING & MATHIESEN A.-G. [*Meters*] 27,877/13.

**Switchgear, Fuses and Fittings:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [*Controllers*] 2,418/13; WM. McGEORCH & Co. and McGEORCH [*Switches*] 2,758/13; MILHAM [*Combination adaptor for fittings*] 5,063/13; QUILLIAM [*Sealing boxes containing electrically-worked railway and tramway point mechanism*] 6,982/13; PAISTE [*Plug type fuses*] 15,760/13.

**Telephony and Telegraphy:** KAEHLER [*Telegraphy*] 8,173/13.

**Traction:** JULIUS PINTSCH [*Signalling*] 3,561/13; IRVING and BRITISH PNEUMATIC RAILWAY SIGNAL CO. [*Electro-pneumatic signalling and point working*] 8,746/13.

**Miscellaneous:** BOWES, SCOTT, & WESTERN and DALGLEISH [*Magnetic separators*] 3,046/13; HARRINGTON [*Illuminated signs*] 5,010/13; OBERLANDER, KAZVINCZY, and GROSS [*Moving advertisements*] 8,711/13; RUSHTON [*Clocks*] 10,100/13; SIEMENS BROS. (*Siemens & Halske A.G.*) [*Setting apparatus from a distance*] 18,751/13; BICKFORD, SMITH & Co. and SMITH [*Blasting fuses*] 28,634/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, and Transformers:** A.E.G. [*Automatic protection against damage due to ignition of air-filters*] 24,450/13; FRIEDR. KRUPP A.-G. [*D.C. dynamo*] 1,405/14; SIEMENS SCHUCKERTWERKE GES. [*A.C. commutator machines*] 2,409/14.

**Switchgear, Fuses and Fittings:** OLAZABAL ENLATE [*Pneumatic current limiter*] 25,236/13; RADLEY [*Motor controllers*] 1,975/14; McKINNIE [*Illuminating or reflecting*] 2,529/14.

**Telegraphy and Telephony:** FESSENDEN [*Oscillatory electro-dynamic apparatus for submarine signalling*] 18,765/13; SIEMENS & HALSKE A.-G. [*Telephone systems*] 1,792/14, 1,871/14, and 2,211/14; GOLDSCHMIDT [*Spark-gap for wireless*] 2,214/14; LYNG [*Signalling systems*] 2,595/14.

**Miscellaneous:** HILLESHEIMER [*Air washers*] 2,143/14.

## Amendments to Specifications

20,277/04. **Manufacture of Drawn Tungsten Filaments.** C. D. ABEL (*Siemens & Halske, A.-G.*). This specification has now been amended on the application of Siemens Bros. & Co. practically as asked. (*ELECTRICAL ENGINEERING*, May 8th, 1913, p. 264; Vol. VIII.)

21,462/11. **Absorption of Radio-Active Emanations.** C. ABEL-MUSGRAVE. This specification has been amended by way of disclaimer under section 8 of the Act. The subject-matter relates to increasing the collecting powers for radio-active emanations of carbon, &c., by applying a negative potential.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

3,968 of March 1st, 1900. **Siphon Recorders.** A. MUIRHEAD and R. H. EDGAR. A protection for the signal coil is provided by placing it in a secure part of the instrument where it can be kept covered. It is suspended by single fibres top and bottom, and connected by double fibres to the siphon suspension, which is placed in the front part of the instrument. This suspension is adjusted by a guide bearing against the directive strips and travelling up and down between two vertical rods. By means of a separate circuit wound on the signal coil the damping can be adjusted. Other features of the invention relate to a stiffening construction for the siphon, and to the governing of the driving motor.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** E. GIRAUD [*Overhead lines: protection of system against breakage of line*] 23,978/03; W. H. K. BOWLEY [*Flexible cable armouring*] 24,125/03; VICKERS, SONS, & MAXIM and A. D. WILLIAMSON [*Control for planing machines, &c.*] 23,908/08.

**Switches, Fuses and Fittings:** M. KALLMANN [*Automatic motor starters using a series resistance of iron*] 24,995/06.

**Telephony and Telegraphy:** G. L. ANDERS and M. BYNG [*Selective switch, relay or indicator*] 23,971/04.

**Traction:** J. P. TIERNEY and J. MALONE [*Working rail and tramway points from the vehicles*] 22,763/05.

**Miscellaneous:** J. STONE & Co. and A. H. DARKER [*Ventilating railway vans, ships, &c.*] 22,452/05.

## ELECTRIC LIGHTING OF MOTOR CARS

IN a Paper on Electric Lighting for Motor-cars, by Mr. J. C. Hutton, recently read at a meeting of the Wolverhampton and District Engineering Society, the author remarked that electric lighting had practically superseded all other methods for motor-car lamps, and proceeded to outline the various dynamo systems which have been developed to keep the battery charged. The problem was to provide a dynamo which would give a practically constant voltage at all engine speeds above a certain value, in conjunction with automatic features, to connect and disconnect the battery at the proper times. In the permanent magnet type, such as the "Magnetolite" and "Lodge" machines, the constancy of voltage was obtained by the exaggeration of armature reaction and resistance drop. He next described at some length the Brolt, Rotax Leitner, and C.A.V. systems, all of which have been referred to in our columns from time to time, and also depend largely on armature reaction for the voltage regulation. Another method of regulation was by iron wire ballast resistances either in the field circuit, as

in the Rushmore system, or in the main circuit, as in the Lathanode system. A curious electrically regulated machine was the "Magician," in which the brushes were rocked by the movement of the body of the machine on ball bearings. On the whole, however, the author preferred mechanical to electrical regulation, on the ground that if the dynamo is not to be subjected to too large a speed variation, it could be smaller and better designed as regards heating and commutation. He described a centrifugal slipping clutch used in the T.E.C. system of the Efandem Co. (Wolverhampton) for preventing the dynamo speed rising above a certain value, and then proceeded to give details of the solenoid cut-out switches usually employed to disconnect the dynamo when the speed falls below the lower limit of its constant voltage range. He did not favour the system in which the dynamo is allowed to free-wheel as a motor in these circumstances. A useful detail in switchgear was to interlock the headlamp and dynamo switches, so that the former could only be used when the dynamo was charging the battery. Particulars were also given of a tail-lamp indicator.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 123. —

## CATALOGUES, PAMPHLETS, &amp;c., RECEIVED

**LIGHTING FITTINGS.**—A supplementary list has just been issued by The Benjamin Electric, Ltd. (1A Rosebery Avenue, E.C.). Besides full particulars and prices of the well-known Benjamin lighting specialities, there is information on industrial and other lighting problems, together with illustrated examples of good illumination for various classes of work obtained by the use of "Benjamin" equipment. All the fittings have been scientifically designed and mechanically constructed, and when correctly installed excellent results are obtained. We note that the list embraces weatherproof reflector fittings, steel reflectors, with the "Ezekleen" reflecting surface, for mills, factories, workshops, &c., "Marbella" opal reflectors, semi-indirect fittings with wireless cluster body, and a variety of fittings for shop-window and show-case lighting. In addition may be mentioned the new Benjamin-Wirt "Dim-a-Lite" turn-down attachment for lamp-holders, hand-lamps, and a number of useful accessories, including a friction-drive screwdriver set, with provision for using a number of different sized blades.

**INSULATING MATERIAL AND WIRE-DRAWING LUBRICANTS.**—A leaflet received from Werths & Co. (41 Aldersgate Street, E.C.) describes a new vulcanised insulating compound for cables and wires, known as Vulcanwax, which we understand has already been adopted by well-known cable makers in this country. Another leaflet from the same firm deals with "Hydrofat" lubricants for wire drawing. These are fats which readily emulsify in water, but have undergone no process of saponification and are quite neutral in their chemical reaction.

**CONDENSERS.**—The "Hydra" condenser for telephone, telegraph, and other purposes is listed in a leaflet from James McMillan & Co. (Clun House, Surrey Street, Strand, W.C.), in capacities from 0.06 to 10 mfd. These are very compact, and great constancy is claimed for their capacity.

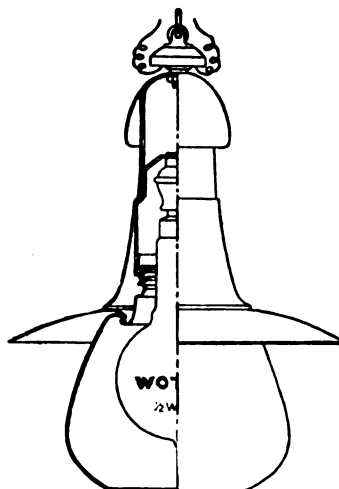
**HEATING AND COOKING.**—We have received from Simplex Conduits, Ltd. (Garrison Lane, Birmingham), copies of supplementary catalogues dealing with Plexsim cooking and Plexsim heating apparatus. Both of these lists are arranged for overprinting with customers' names and addresses. Requests for supplies should be addressed to the Birmingham office of the company. Among the articles listed in the cooking catalogue is a rapid boiling plate in 6-in. and 7-in. sizes, loaded to 800 and 1,200 watts respectively. By the addition of an extension piece, an increased heating surface may be obtained. Other items include a new type of coffee pot, curling tongs heaters, bed-warmers, and electric irons. The heating catalogue covers a wide range in lamp radiators, including a series in period styles, convectors, and the adjustable Plexsim glowing fire, which is loaded to 600 watts only.

The Editor has received from the Union Cable Co., Ltd. (Dagenham Dock, Essex) a compact and useful form of cigar-lighter of simple and robust construction, such as the company are distributing to their friends.

We are in receipt of an artistic wall calendar from Kelvin, Bottomley & Baird, Ltd. (16 Cambridge Street, Glasgow).

## HALF-WATT LAMPS FOR SHOP LIGHTING

THERE is undoubtedly a large field in the application of half-watt lamps for shop lighting, both interior and exterior. Messrs. Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston), send us particulars of some new lanterns which are specially adaptable to this purpose. In designing these lanterns for their Wotan half-watt lamps special care has been taken to ensure efficient ventilation, and an adjustable carrier is provided to regulate the position of the lamp in the lantern. They are made of black, vitreous enamelled iron, and provided with an insulated shackle suspension. One of these patterns has a metal parabolic reflector, and is intended for the exterior illumination of



With opal globe open at the bottom.



With parabolic reflector.

HALF-WATT FITTINGS FOR SHOP LIGHTING.

shop windows. In this case a maximum illumination is focussed in one direction, whilst the source of light is well screened from the eye on the opposite side. These lanterns should become very popular for the window lighting of large stores and business establishments. The other lantern, which is illustrated here, is fitted with a distributive type of metal reflector and an opalescent globe open at the bottom. The effect of this globe is to give a soft diffusion of light without diminishing the floor illumination—at the same time being open at the bottom, it aids the effective ventilation of the lantern. The size of lantern for use with a 1,000-c.p. half-watt lamp is 19 in. by 14 in., and the list price is as low as 27s. A price list embodying these designs will shortly be issued.

### "HALF-WATT" LIGHTING

ACCOUNTS of two interesting installations of Mazda half-watt lamps have been sent us by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.). One of these is in the Bargain Basement at Messrs. Selfridge's, Oxford Street, where a number of Mazda half-watt lamps equipped with Alba glass spheres have recently been installed in place of enclosed arc lamps. Some tests made in this department gave the following results: The enclosed arc lamps, fitted with opal reflectors, and consuming



FIG. 1.—HALF-WATT LAMPS AT SELFTRIDGE'S.

780 watts each, gave an average intensity of 2.5 foot-candles on a plane 3 ft. from the floor. The same number of 500-watt Mazda half-watt lamps, equipped with Alba spheres, gave an average of 7.5 foot-candles in precisely similar conditions. If the half-watt lamps had been fitted with reflectors instead of globes, their comparative efficiency would have been even higher. As it is, the substitution of Mazda half-watt lamps has effected a saving of 36 per cent. in current, and an increase in illumination of 200 per cent. So far as colour matching is concerned—and this is a very important con-

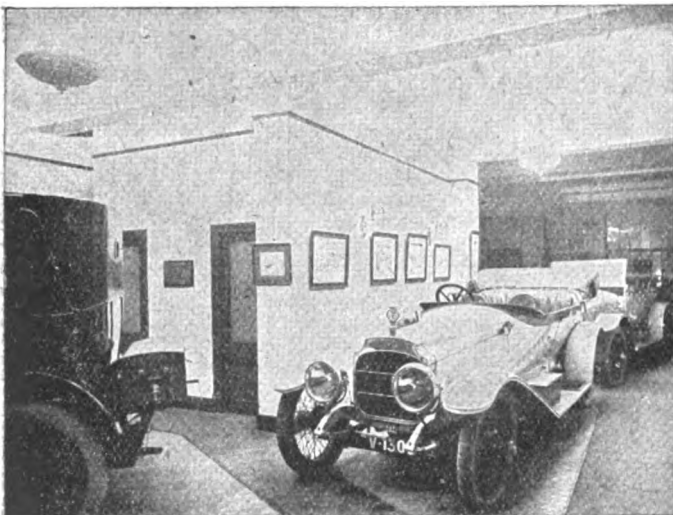


FIG. 2.—HALF-WATT INDIRECT LIGHTING AT THE VAUXHALL SHOWROOMS.

sideration in such installations—the illumination given by the half-watt lamps is equally as good as the original arc light—that is to say, about the same number of colours can be matched under both. For example, although blues, greens, greys, &c., are better matched by arc lamps, reds, browns, yellows, &c., can be judged more accurately under the light of the half-watt lamps.

The other installation referred to is at the Vauxhall Motor Co.'s showroom in Great Portland Street, and consists of Mazda half-watt lamps in composition bowl "Eye-Rest" fittings. Indirect lighting has special advantages in a motor

showroom in the absence of shadows, which even renders it possible to examine the under part of a chassis without using a hand-lamp, and in this case these advantages are combined with the improved efficiency of the half-watt lamps, so that economy as well as excellent illumination is obtained.

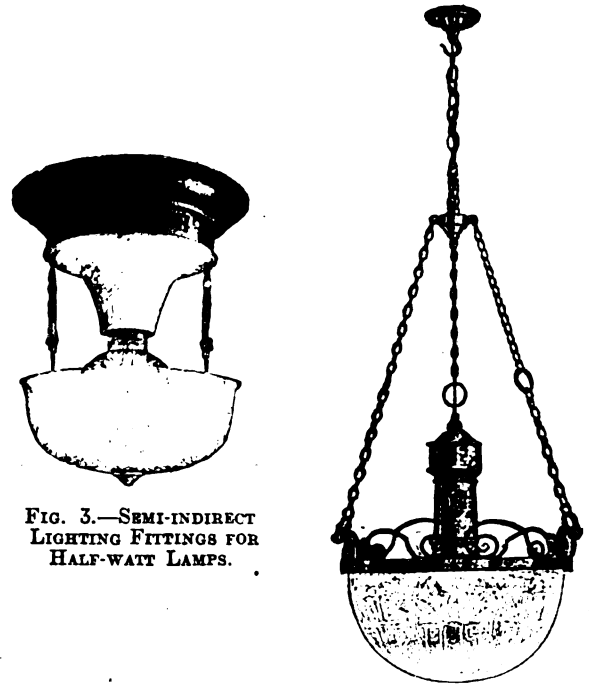
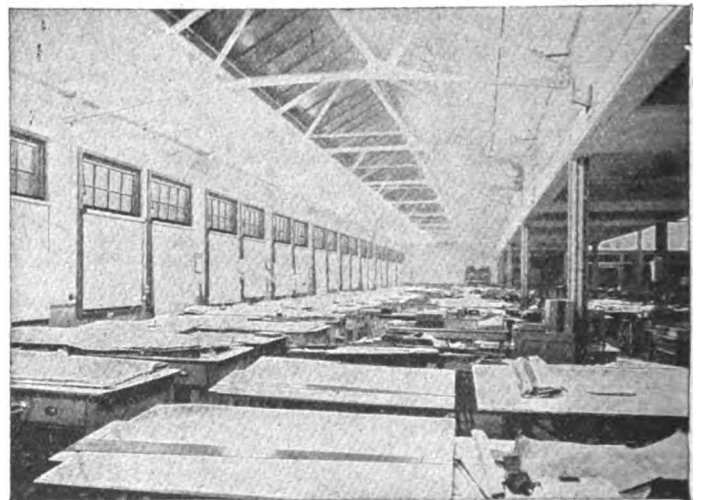


FIG. 3.—SEMI-INDIRECT LIGHTING FITTINGS FOR HALF-WATT LAMPS.

The B.T.-H. Co. have just put on the market two more half-watt fittings, which we illustrate in Fig. 8. Both are for semi-indirect lighting, one having a beautifully etched Calla glass bowl, and the other being a short suspension fitting with an opalescent bowl and a white top reflector.

### A WELL-LIGHTED DRAWING OFFICE

THE lighting of a drawing office is not an easy problem, and some interest attaches to the way in which the British Thomson-Houston Co.'s Illuminating Engineers tackled the question in the Company's own drawing office at Rugby. Semi-indirect fittings equipped with clusters of Mazda lamps are used. The fittings are of the "Lumino"



B.T.-H. DRAWING OFFICE AT RUGBY.

type described in ELECTRICAL ENGINEERING a few weeks ago, and have opalescent globes and white enamelled metal-top reflectors. There is a double row of these fittings down the whole length of the drawing office, which means roughly one fitting to each two drawing boards. The fittings are suspended from the girders, about 12 ft. above the drawing boards, and the illumination is such that it is impossible for a draughtsman to cast a shadow on his board from any direction.



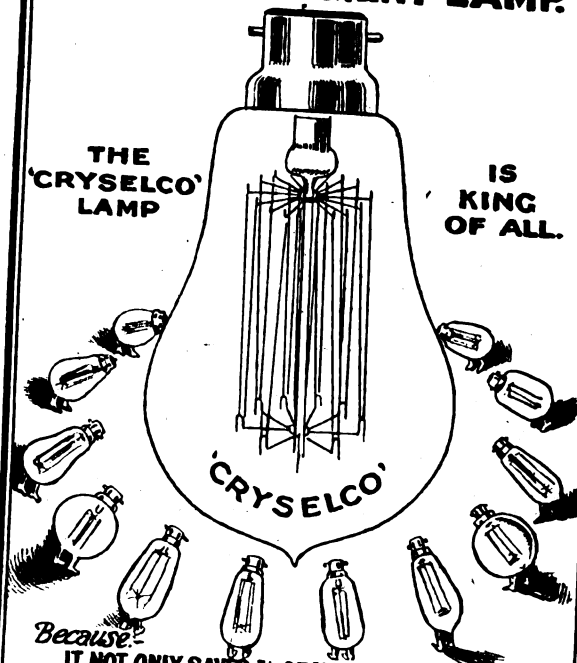
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VARIOUS TYPES & SIZES  
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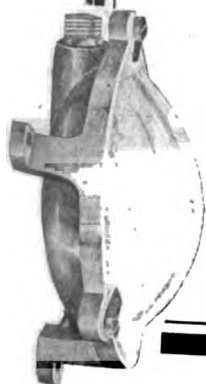
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## Time Costs Money

and Machining takes time and moreover does not always give perfect interchangeability—an essential requisite of such pieces as that here shown.

## "PRANA" DIE-CASTINGS

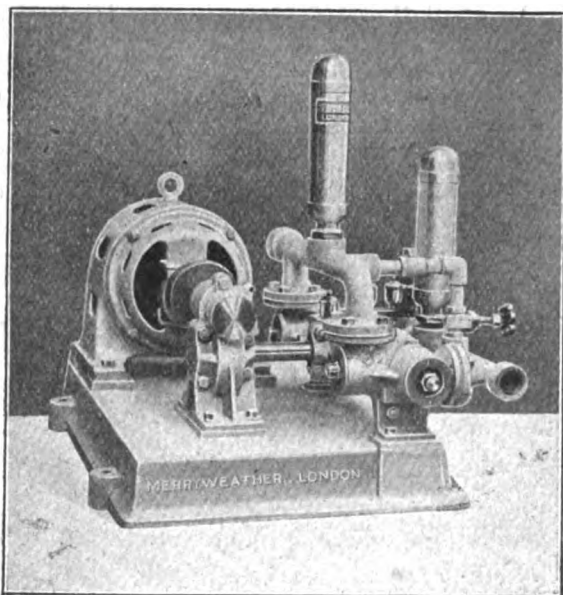
save machining—ergo, time and money, and are accurate, reliable and interchangeable.

**BUT THEY MUST BE "PRANA"**  
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Write for Leaflet E.E. 6 to  
**AERATORS Ltd.** UPPER EDMONTON, LONDON, N.

## AN ELECTRIC PUMP

A VERY serviceable little pump, known as the "Ravensbourne," has recently been introduced by Messrs. Merryweather & Sons (Greenwich Road, S.E.). It is made in sizes ranging from 500 to 4,000 gallons capacity per hour, and is well adapted for driving electrically. It is specially suited to small horse-powers, and is being extensively adopted in cases where light pumping machinery is in demand. The illustration shows a compact set of this design, which has recently been fitted up at Pyrford Court, Woking (the seat of the Hon. Rupert Guinness), for garage water-supply. The pump is of the double-barrel reciprocating type, constructed of gun-metal, with copper air vessels, and is capable of delivering

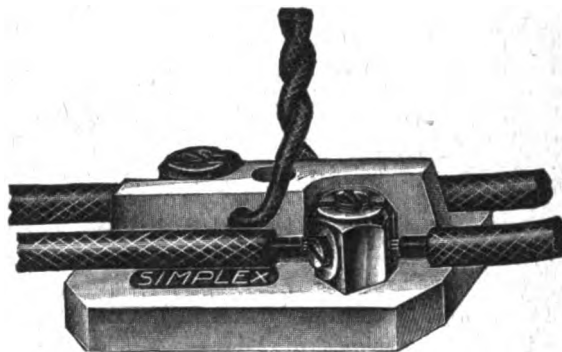


"RAVENSBOURNE" ELECTRICALLY-DRIVEN PUMP.

500 gallons per hour against a head of 100 ft. It is driven by an electric motor running at a speed of 960 r.p.m., and developing 1 h.p., the current being taken from the existing electric light installation. The pump draws its supply from a rain-water tank, and delivers through a wrought-iron pipe into a tank placed on the roof of the garage. The roof tank is fitted with an outlet pipe to a tap close to the yard-level, to supply water for cleaning operations—such as the washing-down of cars. A branch is also taken from the delivery pipe at a point between the pump and the roof tank. The branch serves a small hydrant in the yard, from which the full pressure from the pump can be obtained for fire-extinguishing purposes. The roof tank is fitted with an alarm indicator, with float and electric bell, which rings automatically when the tank is full.

## ACCESSORIES FOR CONDUIT WIRING

WE have received from Simplex Conduits, Ltd. (116 Charing Cross Rd., W.C.), particulars of several new items which have recently been added to the well-known conduit system of electric wiring which bears their name. These include interlocking switches and plugs, watertight switches, various types of conduit holdfasts, and porcelain interiors. The conduit holdfasts are designed for conduit runs which require to be attached to girders, and patterns are shown which are suitable for attaching the tube both when the run is parallel to the girder and when at right-angles. Other forms of these are intended for surface installations in factories and situations where moisture is present. They are so designed as to space the conduit some distance away from the surface of the wall, and are specially recommended



NEW DESIGN OF PORCELAIN INTERIOR FOR RECTANGULAR JUNCTION BOXES.

where it is desired to paint the conduit subsequent to erection. Another item of interest is a new design of porcelain interior, which we illustrate herewith, intended for use with standard types of rectangular junction boxes as a means of tapping off the main circuit wires or for connecting a flexible wire to a light point. The interior is double pole, and has two main terminals of special design, hexagonal in shape, and with a central slot threaded internally to take a grub screw. The particular advantage of this type is that it is not necessary actually to sever the conductor to make connection. The insulation is bared back about half an inch, and the exposed conductor dropped into the slot and secured by the grub screw. The terminals are of sufficient size to allow of a small cheese-head screw being tapped into the side for connecting the branch wires.

**Deported Tantalum Lamps.**—With their characteristic smartness, Siemens Brothers' Dynamo Works, Ltd. (Incandescent Lamp and Fittings Department, Tyssen Street, Dalston), have seized the opportunity of the arrival of the deported South African Labour leaders to inform us that the *Umgeni* is one of the many boats fitted with marine type "Tantalum" Traction Lamps. Messrs. Bullard, King & Co., who control the Natal line of steamships (to which the *Umgeni* belongs), have been using "Tantalum" lamps for lighting their fleet of steamers during the past three years with complete satisfaction.

**Metal Filament Lamp Patents.**—Osram Lamp Works, Ltd., has now issued a writ against Dick, Kerr & Co., Ltd. (Abchurch Yard, Cannon Street, E.C.), and Watlington & Co., Ltd. (48 Milton Street, E.C.), in connection with the sale of "Britannia" lamps, for alleged infringement of the Osram Patents Nos. 23,899/04 and 18,622/06. These are the patents relating to the production of pressed filaments which Mr. Justice Warrington decided were infringed by the "Z" Electric Lamp Manufacturing Co., Ltd., in the action brought against them by Osram Lamp Works, Ltd., in April, 1912. Since then several lamp companies have taken out licences to manufacture under these patents, and many dealers in lamps not made under licence, as well as lamp manufacturing companies, have been proceeded against.

**Half-Watt Lamps.**—The list of half-watt lamps referred to in our last issue was sent us in error. No new sizes are on the market in this country since those announced in our issue of January 15th.

FOR  
**STEAM JOINTS**  
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## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Basingstoke.**—Tenders will shortly be invited for plant for the Council's new power station.

**Bexhill.**—Cable extensions.

**Burton-on-Trent.**—An expenditure of £6,000 is to be incurred upon new plant at the power station.

**Dorchester.**—Tenders are invited for the electric lighting of the Town Hall and Corn Exchange. Borough Engineer. March 2nd.

**Dublin.**—Twelve months' supply of arc-lamp carbons. City Electrical Engineer. March 8rd.

**Knaresborough.**—Mr. George Wilkinson, Borough Electrical Engineer at Harrogate, has presented an electric supply scheme to the Council. The capital cost is put at £3,180, and a profit of £812 is estimated upon the sale of 40,000 units at 5d. per unit.

**Lancashire & Yorkshire Railway.**—At the annual meeting last week it was stated that a new power station is to be erected at Clifton Junction.

**London: St. Pancras.**—In order to comply with the Home Office Regulations, alterations are to be made at the Tavistock Place substation, involving an expenditure of £437. These include additional sections to the high-tension board of fool-proof design.

The Finance Committee of the L.C.C. recommend sanction to a loan of £9,248 for electrical extensions.

**Pembroke.**—Twelve months' supply of electrical stores. March 2nd. Borough Electrical Engineer.

**Rawtenstall.**—Street electric lighting at an estimated cost of £1,000 is to be carried out.

**Rotherham.**—One 2,000-kw. turbo-alternator, condensing plant, switchgear, &c.; one 1,000-kw. rotary-converter, transformer and switchgear; one 20-ton overhead crane. Borough Electrical Engineer. March 12th.

**Salford.**—One 40-h.p. electric motor. Borough Electrical Engineer.

**Stafford.**—The Corporation electricity department requires 5,600 yds. of new cable at an estimated cost of £6,300.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barrow-in-Furness.**—Electric lighting at Blake Street school. Borough Electrical Engineer. March 3rd.

**Birkenhead.**—New school (£11,000).

**Blackpool.**—Hydro. (£100,000). Architects, Clegg & Sons, Manchester.

**Bradford.**—Two-storey warehouse at Greengates. Architects, Moore & Crabtree, 3 and 4 Exchange Buildings.

**Coventry.**—Extension of lighting system at workhouse. Architect, T. F. Tickner, High Street Chambers.

**Glasgow.**—Extensions to municipal buildings. Town Clerk, March 2nd.

**Halifax.**—Theatre. Associated Provincial Theatres, London.

**Holywell.**—Electric lighting is to be installed at the workhouse.

**Penistone (Sheffield).**—The Guardians are considering the installation of electric lighting.

**Salford.**—Additions to Nurses Home, Stepping Hill Hospital. Architects, Peirce & Son.

**Swansea.**—Additions to sanatoria (£12,000).

**Watford.**—New infirmary. Clerk to Guardians, Watford Place.

### Miscellaneous

**Australia.**—As from time to time tenders are called for by the Australian Commonwealth Postmaster-General for electrical supplies to standard specifications, it may interest British firms to know that a number of these specifications can be seen on file at the Commercial Intelligence Branch of the Board of Trade.

The Deputy Postmaster-General, Adelaide, requires a supply of thirty-five magneto and twenty common battery switch-

boards. April 8th. Copies of specification, &c., at 72 Victoria Street, S.W.

**Belfast.**—Twelve months' supply of electrical accessories for the Tramways Department. Chief Engineer. March 9th.

**Edinburgh.**—Twelve months' supply of electrical materials for interior wiring. City Electrical Engineer.

**Leeds.**—Reconstruction of tramway track. General Manager. March 8rd.

**Liverpool.**—Twelve months' supply of electrical stores for the Vestry of the Parish of Liverpool. Clerk, Parish Offices.

**Manchester.**—Further electrification of the works at the collieries of Andrew Knowles & Sons, Pendlebury.

**Merthyr Tydfil.**—Twelve months' supply of electrical stores for Guardians. Clerk, 134 High Street.

**Oban.**—A scheme for substituting electricity for gas in the street lamps at an estimated cost of £1,178 has been approved by the Council.

## TENDERS RECEIVED AND ACCEPTED

**London: India Office.**—The tender of the Edison & Swan United Electric Light Co., Ltd., has been accepted for Royal Ediswan lamps.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £67 to £67 10s. (Last week, £67 5s. to £67 15s.)

**Bankruptcy.**—A first dividend of 3s. in the £ has been paid in the bankruptcy of J. G. Hilton, Electrical Engineer, 235 Hagley Road, Birmingham.

**Companies Struck Off Register.**—The following have been struck off the register of joint stock companies: Auto-Controllers, Ltd.; Electrical Instrument Manufacturers, Ltd.; Improved Electric Traction, Ltd.

The following will be struck off the register at the end of three months, unless cause is shown to the contrary: Bombay Hydro-Electric Syndicate; Pearson Fire Alarm, Ltd.

## APPOINTMENTS AND PERSONAL NOTES

Mr. J. A. Bell, City Electrical Engineer at Aberdeen, has applied for an increase in salary. It is ten years since this matter was last considered by the Council, and during that time the output of the electricity undertaking has doubled.

The following increases of salary are recommended by the Highways Committee of the L.C.C.:—Mr. J. Welling, Permanent Way Engineer, from £575 to £600 per annum; Mr. A. R. Owen, Claims Superintendent, from £500 to £550 per annum; Mr. W. E. Ireland, Rolling Stock Superintendent, from £500 to £525 per annum; Mr. H. S. May, Assistant Rolling Stock Superintendent, from £300 to £325 per annum.

Mr. R. F. Dixon, Chief Electrical Engineer at the Hull Corporation tramways power station, has been appointed Works Superintendent in the Southampton Tramway Department, at a salary of £150, rising to £200. There were ninety-one applications.

A chief assistant is required in the Physics and Electro-technics Department of the Borough Polytechnic. (See advertisement on another page.)

An assistant engineer and superintendent is required by a firm of electric lighting contractors. (See advertisement on another page.)

## LOCAL NOTES

**Brighton: Electricity Profits.**—The amount to be taken from the electricity undertaking to relief of rates for the current year has been discussed. The Finance Committee's estimates included a sum of £5,000, but an amendment was moved reducing this to £3,000. After considerable discussion in the Town Council, however, the amendment was defeated by twenty-nine votes to fifteen.

**Crook: Public Lighting.**—An offer by the Newcastle Electric Supply Co. to supply current for 220 lamps at 27s. per lamp until midnight, or 30s. per lamp from dusk to dawn, has been referred to the Committee for further consideration.

**Grimsby: Supply Tariffs.**—The Engineer has been instructed to inquire into the rateable value and other systems of charging in order to ascertain to what extent the charges to consumers can be modified.

**Hornsey: I.M.E.A. Bill.**—The Council has refused to pass a recommendation asking Lord Ronaldshay, Member of Parliament for the district, to support the I.M.E.A. Bill in its present form. The Electricity Committee has taken the matter back in order to redraft the recommendation so that the Bill shall be supported if all wiring work is done through contractors.

**Huddersfield: Extensions of Electricity System.**—The Newmill Urban District Council has asked the Corporation to go into the question of extending the electric supply undertaking to that district, which is some two miles away from the present terminus of the Huddersfield tramways.

**India: Tata Electric Power Scheme.**—It is anticipated that the first supply of power from the Tata electric power scheme will be given in March.

**Liverpool: Electricity Accounts.**—The electricity accounts for the year ended December 31st show that after meeting capital charges and transferring £26,928 to renewal fund, a contribution of £25,000 is made to the relief of rates. The reserve fund now stands at £184,472, and the renewal fund at £115,152.

**London: Marylebone: Electric Lighting Loan.**—The Council is to take up a loan of £225,000 from the Liverpool Corporation in connection with the extension of their electricity undertaking.

**St. Pancras: Electricity Income Tax Assessment.**—The Surveyor of Taxes has agreed to a new basis of assessing the profits of the electricity undertaking, which has resulted in reducing the amount payable by £248. The new basis was evolved by Mr. Sydney Baynes, the Borough Electrical Engineer, and in deducting the profit derived from the supply of current for street lighting, as is the practice, consideration has been given to the actual cost of generation instead of taking the average cost, as was done in the past. The total units generated for both public and private lighting are now substituted for the total units sold, for the purpose of fixing the proportion of generating expenses incurred on public lighting.

**Lowestoft: Electrical Home Exhibition.**—An Electrical Home Exhibition will be held from April 22nd to May 2nd, under the auspices of the Electrical Department at the New Skating Rink, Freemantle Road. The address of the Organising Manager is 20 Pimlico Road, London, S.W.

**Macclesfield: Electricity Supply.**—The New Electricity Co. of Macclesfield anticipates being able to give a supply by Easter. It is now quite a number of years since electric supply schemes were first prepared for this district, and local manufacturers at one time almost despaired of ever obtaining a supply.

**Middlesbrough: Electric Supply.**—Last year the Corporation secured a transfer to the Middlesbrough area of the district of North Ormesby. An application for a supply of electrical energy from that district has caused consideration to be given to the position that the Cleveland & Durham Electric Power Co. is the electrical supply authority for North Ormesby. An attempt is to be made to arrange terms with the Company for the Corporation to supply in North Ormesby.

**Preston: Electric Supply.**—Notice has been given by a member of the Council of his intention to move a resolution recommending the appointment of a committee to consider the necessity for making additional provision for the supply of electricity in the borough, and, if thought desirable, to get into touch with the National Electric Supply Co. on the subject.

**Southampton: Position of Electricity Undertaking.**—The

difference of opinion between the Chairman of the Electricity Committee and the Borough Electrical Engineer, and a recent decision to slightly increase the hiring terms of electric radiators, seems to be having unfortunate results. Not unnaturally the Gas Company is taking full advantage of the present position, and the impression is growing among electricity consumers that prices will be increased all round by the Electricity Department. The result has been that since December 31st, when the higher rental came into force, 160 radiators have been returned. A few other consumers, apparently in a state of panic, have also returned other electrical apparatus on hire. The Borough Electrical Engineer has sent in a special report calling attention to the position.

**Southport: Electricity Tariff.**—The rateable value system of charging for electricity supply is under consideration by the Electricity Committee.

**Swansea: Electricity Profits and Rates.**—The Finance Committee, on its consideration of the possible amount which the Electricity Department should contribute to relief of rates for the current year, has been met with strong opposition from the Electricity Committee. It was pointed out that the reserve stands at £8,000, whereas it ought to be £20,000, but eventually the Finance Committee recommended the Council to allocate £700 from the electricity undertaking. During the past two years £2,200 have been taken from electricity profits for this purpose.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Dividends of London Supply Companies.**—The Westminster Electric Supply Corporation recommends a final 10 per cent. dividend, making 10 per cent. for the year, the same as in 1912.

A 5½ per cent. dividend is recommended on the ordinary shares of the South London Electric Supply Corporation for last year, the same as for the previous year.

A final dividend, making 9 per cent. for 1913, has been declared by the Kensington and Knightsbridge Electric Lighting Company. This is the same as for 1912.

**Waste Heat & Gas Electrical Generating Stations.**—The report for the year to January 31st shows a net profit of £28,745, after crediting reserve with £9,500, whilst the total balance available, adding the amount brought forward, is £37,710. A final dividend, making 8 per cent. for the year, is recommended, carrying forward £12,110. During the year two new generating stations have been put into operation, utilising exhaust steam from the Hordern Collieries.

**Newcastle-on-Tyne Electric Supply Co.**—A final dividend, making 5½ per cent. for the year, is recommended, an increase of ½ per cent.

**Bournemouth & Poole Electricity Supply Co.**—A final dividend, making 7 per cent. for the year, an increase of 1 per cent. over the previous twelve months, is recommended.

**Bruce Peebles & Co.**—The results of the trading for 1913 show a considerable advance on previous years. After meeting mortgage and debenture interest there is a net profit of £2,821.

**W. T. Glover & Co.**—A dividend of 5 per cent. is recommended on the ordinary shares, together with a bonus of 2½ per cent., both being the same as for the previous year. The sum of £6,500 is allocated to debenture redemption, £5,000 to reserve, and £5,000 is carried forward.

**British Electric Transformer Co.**—There was a net profit of £26,123 on last year's working, and a dividend of 10 per cent. is recommended on the ordinary shares, as in the previous year.

## NEW COMPANIES

**NORTH BRITISH ELECTRIC WELDING CO.**—Capital, £4,000. The subscribers include L. S. Taylor, Consulting Engineer, 610 Royal Liver Building, Liverpool.

**DORMAN & SMITH,** Ordsal Electrical Works, Salford. Capital, £50,000. To take over the existing business.

**WAYGOOD LIFTS (SOUTH AFRICA).**—Registered by Bristowe, Cooke & Carpmael, 1 Copthall Buildings, E.C. Capital £10,000. To take over the business now carried on by R. Waygood & Co. in South Africa.

**IRISH TELEPHONE (NEW SYSTEM) CO.,** 55 West Regent Street, Glasgow. Capital, £2,500.

**SCEANDO LAMP CO.,** 7 Blackfriars Street, Salford. Capital £100.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 375 [VOL. X., No. 10]  
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THURSDAY, MARCH 5, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES and TECHNICAL COLLAGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 304-306, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circuiting, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

A NEW I.M.E.A. Bill is being drafted to give local authorities power to sell and hire electric lighting and heating apparatus, but making it obligatory to sub-let the wiring to a contractor, without undue preference. Other interesting clauses are included, and the B.E.A.M.A. has promised its support to the Bill. (Page 127.)

We give some further information with regard to the opposition to the London Electric Supply Bill. (Page 127.)

THE design of choking coils and auto-transformers for obtaining a reduced voltage from an alternating voltage is dealt with in our Questions and Answers columns. (Page 128.)

THE Home Office inquiry into the Senghenydd disaster has been completed, and some of the most interesting evidence has been the account of special experiments to determine the degree of danger of ignition of gas by sparks from signalling circuits supplied at different voltages. (Page 129.)

In a Paper on the design and maintenance of miners' electric safety lamps, read by Mr. F. J. Turquand before the London Branch of the Association of Mining Electrical Engineers, the author emphasised the need for properly annealed glass domes. He estimated the life of a lead cell in a miner's lamp at about 500 charges and discharges, equivalent to about twelve

months' use. Mr. W. Maurice put the life of the whole lamp at about half this, but Mr. Haslam put the life even higher than the author did. Almost all lamps now made have rotating switches. (Page 130.)

A PAPER read recently before the Association of Mining Electrical Engineers by Mr. H. J. Wroe described a powerful electrical pumping installation used during sinking at the Tilmanstone Colliery, Kent. (Page 131.)

THE patent specifications published during February which are of special interest to mining electrical engineers and electrometallurgists embrace miners' safety lamps, blasting fuses, induction furnace design, the driving of non-reversing rolling mills and magnetic separators. (Page 131.)

AN attempt is being made to revive the agitation against electricity in mines. (Page 133.)

A SPECIAL design of gate-end box is illustrated. (Page 133.)

THE following specifications are among those published by the Patent Office last week:—One by J. Brookie and Johnson & Phillips for a magazine arc lamp, one by J. Canello for a process of manufacturing malleable tungsten from the pure powdery metal, and one by H. and P. Kaehler for a printing telegraph, in which some of the principles of the Hughes and Murray instruments are combined. (Page 134.)

AT the Institution of Electrical Engineers last Thursday, Mr. F. Lydall stated, in a Paper on electric locomotives, that there was at present a general tendency towards the use of gearing in place of side-connecting rods. For D.C. freight locomotives in this country the articulated bogie principle with four-g geared motors was the best. During the discussion, Mr. Roger T. Smith dealt with the advantages of electric traction for heavy freight trains in hilly districts. As every position of the controller in an A.C. locomotive was a running position, the difficulty of slipping of the wheels during acceleration was not so liable to be present as with D.C. locomotives.—A petition against the Bill now before Parliament for providing for a joint committee of the G.N. and Met. Railway Companies to work the G.N. & City Railway is to be deposited.—The section of the L.B. & S.C. Railway from Balham to Wallington will be converted to electric traction during the year. (Page 135.)

WORK on the English base station of the Imperial Wireless Chain has been started at Leafeld, Oxfordshire. India will be in direct communication with Egypt as a suitable site for the proposed three-way station in East Africa could not be found. A site has, however, been chosen for a smaller two-way station in East Africa, as this is necessary for communicating with South Africa. (Page 135.)

SOME new fittings for use with half-watt lamps, and new designs of electrically-driven tools, are described





## MUNICIPAL WIRING POWERS

THE Incorporated Municipal Electrical Association have interested the British Electrical and Allied Manufacturers' Association in a new Bill which they are drafting. The draft Bill has been submitted to the Electrical Contractors' Association for its approval, but if this is not obtained, we understand that the B.E.A.M.A. has decided to support the proposals. We have not been informed when the Bill will be introduced; presumably it would stand more chance of being passed into law after the next General Election than in the present session of Parliament.

The Bill differs in some important respects from the previous one. After giving Local Authorities power to sell and hire electric lighting and heating apparatus, clauses are added to protect the contractor from any under-selling, and it is specifically stated that the wiring is to be sub-let to a contractor without undue preference if there is more than one electrical contractor in the district. Municipal showrooms, exhibitions, and general advertising are to be authorised.

The stand-by supply clause is embodied in a new form, which entitles the supply authority to make a special charge for supply "taken on extraordinary occasions." This, of course, covers stand-by to an independent lighting or power plant, or to gas-lighting or gas, steam, or oil power, but would not entitle a special charge to be made for regular supply to part of a consumer's installation.

As in the last I.M.E.A. Bill, subscriptions to Associations and delegates' expenses are authorised, provisions are inserted with regard to the establishment of a fund for working capital, and the extension of the Conspiracy and Protection of Property Act of 1875 to electricity works is asked for to prevent the continuity of electrical supply being endangered by strikers.

A clause is embodied to exempt from distress, fittings, &c., let on hire by contractors, and a new clause is under consideration to permit mains to be laid in private roads not yet taken over by the Local Authority.

In spite of the great trouble which has evidently been taken to make the Bill acceptable to every section of the industry so as to avoid opposition, we fear that its fate will be indefinite postponement until the political atmosphere is clearer.

## THE LONDON ELECTRIC SUPPLY BILL

WE are enabled this week to give particulars of the terms of the petitions against the London Electric Supply Bill. The London County Council's petition is practically in the same terms as the report of the Parliamentary Committee, published in our last issue, and the Council—almost with sarcasm—objects to any further powers being granted to a number of companies who have apparently not agreed amongst themselves. We may add that it is expected that Mr. Merz's report to the L.C.C. will probably be available in about a month's time, and that, if this is adopted by the L.C.C., it is not unlikely that an entirely new complexion will be placed upon the present controversy.

The Corporation of the City of London has filed a petition against the Bill, pointing out that the proposals are in direct conflict with the powers under which the City Co. and the Charing Cross Co. are carrying on their undertakings in the City, as they are now expressly forbidden from associating except for the purpose of mutual assistance.

Practically all the petitions of the electric supply companies complain that the Bill does not contain definite details of the proposals, and insist that it would be inexpedient to confer powers by which the companies might be competing with one another for postponement of the date of purchase by the L.C.C., or alteration in the terms of purchase. The L.C.C., they say, must not be relieved of its obligation not to purchase one company's undertaking without giving notice to purchase all. The Acts of 1908 and 1909 left the companies in harmony, and they object to "any new factor of disagreement" being introduced. To give powers to the L.C.C. to purchase a new generating station some distance outside the County of London would totally alter the conditions under which the existing stations might be purchased. It is evident that they fear that the result of passing the Bill might be the erection of one or two brand-new stations outside London, and an entirely new system of supply for the metropolis, so that a large proportion of the existing stations and plant would be rendered redundant, and be reduced to "scrap" value so far as its utility for the new system was concerned. Power given to the proposed new

company to carry out this scheme would give it a lever to force the existing companies in, and to some extent to dictate terms to them, and the companies apparently regard their position as more secure under the definite terms of the 1908 Act, by which the L.C.C. is the purchaser of all the companies in 1931.

The petition of the Hammersmith Borough Council says that if the date of purchase of the companies is to be postponed, the right of the Borough Councils to purchase should be restored to them, in view also of the fact that under the Acts of 1908 and 1909 the Borough Councils may co-operate.

The Woolwich Borough Council view with alarm a competitor for supply which they themselves hope to give in contiguous areas. They also foresee that the acquisition of the companies in 1931, if the law remains unaltered, will make it necessary for the L.C.C. to acquire the Borough Council's undertakings at the same time to secure the unification of supply throughout the County of London, which they think should not be deferred longer. They object to the date and terms of purchase being left for determination by individual agreement, and maintain that they should only be dealt with by express enactment of Parliament.

The Marylebone Borough Council, in their petition, raise these two last points also, and in addition insist very much on the useful work they themselves have done to reduce the prices charged for electricity. Mr. Seabrook's personal point of view, we believe, is that the present opportunity might well be taken to perfect a new scheme for the supply of electricity in London, taking account of all the factors that now exist.

The attitude of the London electric supply companies towards the London Electric Supply Bill is also made evident by continued statements at their meetings. At the Annual General Meeting of the Westminster Co. on Wednesday last week, Mr. J. Browne Martin, the Chairman of the Company, said that unless the L.C.C., the Local Authorities, and the supply companies could be brought together in one scheme, no satisfactory result was ever likely to be arrived at. A shareholder asked if it was true that the proposals in the Bill would mean adding about £1,000,000 of "water" to the capital of the London companies. Sir Alexander Kennedy, Engineer-in-Chief to the Company, who was asked to reply, said that the present capital of the London companies is about £15,000,000. It was suggested, he said, to add a further four or five million pounds to erect a new station, and another four million pounds for other purposes, and some £4,000,000 worth of plant would have to be "scrapped."

On the same day, meetings of the Kensington and Knightsbridge and Notting Hill Companies were held, and Colonel Crompton, presiding at the first-named, said that although they were all desirous of securing an extension of the life of the companies, careful watch must be kept on the terms upon which this should be granted. Sir William Crookes, at the Notting Hill meeting, contented himself with assuring the shareholders that the directors were closely guarding their interests.

On Friday, at the meeting of the Charing Cross Co., Mr. W. Fladgate, the Chairman, referring to the economies in generation which were claimed under the proposed amalgamation scheme, pointed out that the estimates of revenue were on the assumption that the present selling prices would be maintained, but no bulk scheme could be sound which did not assume a decrease in price. On the engineering question, none of the London companies at present felt competent to express a definite opinion, as the joint committee of experts under the Chairmanship of Sir Alexander Kennedy, were still conferring with the promoters' engineers. In the various Power Bills for London in the past, the future requirements of London had been greatly exaggerated, whilst the capacity of the existing companies to deal with the increasing demand had been greatly under-estimated. The work of unifying electric supply in London must be a gradual one, and could be done at a comparatively small cost by agreement among the interested parties, which would be better and more convenient than throwing the industry into the melting-pot, and calling in the aid of the millions of the financier. Incidentally, he mentioned that the promoters seemed to have provided for a profit to themselves of well over a million. Messrs. Slaughter & May, in a letter to *The Times*, stated that Mr. Fladgate's remarks are "seriously inaccurate"; Mr. Fladgate thereupon challenged the production of figures to disprove them, but his challenge has not yet been taken up.

The second reading of the Bill has been deferred until March 16th.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,381.

On accumulator switchboards for lighting installations, the charge and discharge regulating switches for the end cells are often interlocked, so that there cannot be more cells in the discharge circuit than in the charge circuit, at any time. Why is this?

(Replies must be received not later than first post, Thursday, March 12th.)

### ANSWERS TO No. 1,379.

It is required to bring a voltage of 275 A.C. down to 250. Is a choking coil the right solution? If so, give full particulars necessary to make one for a full-load current of 40 amperes at 50 cycles.—"SPARK."

The first award (10s.) is given to "M. M.," for the following reply:—

Of the three practical methods available—transformer, auto-transformer, and choking coil—the choice will be between the two latter. Some would prefer an auto-transformer for the purpose specified, considering there is so small a difference between the impressed and the useful voltage. On the other hand, if the load has a poor power factor, or if arc lamps are

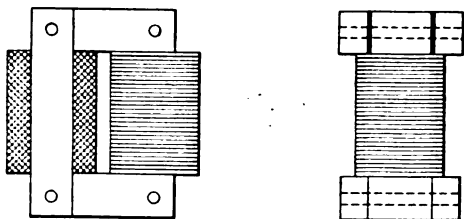


FIG. 1.

used, a choking coil would probably be the better. The following is suggested as an outlined method of designing a choking coil to the given data.

Reactive voltage of the choking coil must

$$= \sqrt{(275)^2 - (250)^2} = 115 \text{ (approx.)};$$

then  $115 = \text{total flux} \times 4.44 \times \text{turns} \times \sim \times 10^{-8}$

With a sectional area of core, 3 in.  $\times$  2 in., and taking 85 per cent. as being actual iron, net iron area =  $3 \times 2 \times 0.85 = 5.1$  sq. in. With a density of 58,000 lines per sq. in., the total flux =  $58,000 \times 5.1 = 295,800$ .

We then have that the number of turns

$$= \frac{115 \times 10^8}{295,800 \times 4.44 \times 50} = 175.3 \text{ (approx.)}.$$

To carry 40 amperes will require No. 4 S.W.G., and this, when double cotton covered = 0.257 in. in diameter. If we allow for eight layers of twenty-two turns each, four layers on each limb, winding space must be  $0.257 \times 22 = 5.65$  in. For convenience in winding and insulation let this be made 6 in.

Fig. 1 gives a suggested arrangement. The yokes are divided into two parts, these halves being bolted to the cores. Between the upper yoke pieces and cores are insulating packings; these are marked black on the drawing.

The thickness of these packings can be altered as required, thus affording a convenient means of regulation. The length of the magnetic circuit is 26 in. (approx.); at the above density of magnetic lines this will mean 9 amperes per in., i.e.,  $9 \times 26 = 234$  ampere-turns. Therefore we have left over for the air-gap  $(40 \times 176) - 234 = 6,806$

$$\text{air-gap} = \frac{\text{ampere turns}}{0.313 \times \text{flux density}} = \frac{6,806}{0.313 \times 58,000} = 0.374.$$

As we have the total air-gap divided into four, each packing may be made 0.1 in. in thickness; this will give sufficient means of regulation by altering thickness as may be required. The iron losses will be about 85 watts, C<sup>2</sup>R loss about 64 watts; this giving an efficiency of 97 per cent. (approx.). With a ventilated case rise in temperature will be about 70° F. The arrangement of the yokes can be altered to suit circumstances; for instance, the lower yoke could be interlaced at the joint with the cores, and the top yoke in one piece with the two air-gaps, &c.

The second award (5s.) is made to "Auto," who writes as follows:—

"Spark" will find an auto-transformer best suited to his purpose. A choking coil would serve if the load is constant, but the volts on the load would vary with the load unless the choker was made adjustable, which may be inconvenient. A suitable auto-transformer would be constructed as follows:—

**Core.**—2 in.  $\times$  2 in. cross-section, worked at about 50,000 lines per sq. in., of, say, Lohys transformer plates laid up in the usual way and of dimensions shown in Fig. 2.

**Winding.**—Before assembling limbs, serve each with a layer of tape, and then two layers of press pahn 0.010 in. thick.

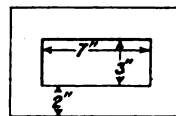


FIG. 2.

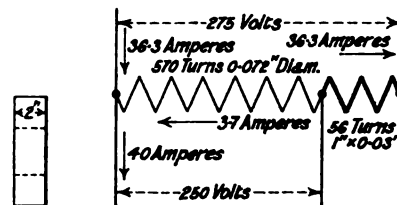


FIG. 3.

Over this wind each limb with 285 turns 0.072 in. diam. copper D.C.C., winding the first layer 6 in. long, and piling the winding. Over this wind twenty-eight turns of taped copper strip 1 in.  $\times$  0.08 in. or equivalent section. The limbs may then be assembled with the yoke stampings, and coupled up so that the circuit shown in Fig. 3 is obtained. Neglecting the small magnetising currents an examination of the auto-transformer principles (see any text-book) shows that at 40 amperes load on the 250-volt side the currents in the circuits are as indicated in Fig. 3. It will be observed that half of each section is wound on each limb, this being necessary in order to avoid excessive leakage. The above auto-transformer would run quite cool and would be suitable for total enclosure. If it is to run open, the copper sectional areas can be cut down.

**The Institution of Electrical Engineers.**—The following is the result of the ballot for new members, and transfers from one class to another, at the meeting last Thursday:—*Elected as Associate Members:* G. H. Browne, G. M. Harvey, P. M. Hogg. *Graduates:* A. D. Church, I. Day, W. S. Finlason, J. V. Levett, P. M. Millns, H. A. Morris, W. T. Parr, J. D. Ravenscroft. *Students:* E. Balmford, M. H. Bhatt, C. R. Bolton, C. W. Boxall, C. A. Coombs, R. de Hollanda, R. Gates, K. N. Ghose, E. P. Gillman, S. J. Grose, T. H. Hall, H. J. Hardie, N. Haws, A. S. Hopkins, H. Hornoyd, C. W. Jardine, C. S. Knight, H. J. McKenzie, C. A. Morton, E. T. Panton, W. S. H. Palmer, W. Richardson, C. E. Saster, F. J. Tindall, H. J. Tolley, R. I. Wells, H. Woodside, C. N. Young. *Candidates Transferred from Associate Member to Member:* J. H. Butters, J. A. Sykes. *From Graduate to Associate Member:* W. T. Golden, A. A. Maytham. *From Student to Associate Member:* I. C. Brown, W. Brown, V. C. Dixon, T. E. Harley. *From Student to Graduate:* T. K. R. Ayengar, J. Brander, A. E. E. Cheal, D. A. Christian, H. W. Curling.

**San Francisco Electrical Congress, 1915.**—The following have been nominated as Honorary Members of the Committee on Organisation of the above Congress, by Mr. C. O. Mailloux, President of the American Institute of Electrical Engineers:—Lord Rayleigh, Sir Charles Parsons, Sir Oliver Lodge, Sir J. J. Thomson, Dr. R. T. Glazebrook, Dr. Silvanus P. Thompson, Mr. W. Duddell, Dr. Gisbert Kapp, Dr. S. Z. de Ferranti, Prof. J. A. Fleming, Mr. W. M. Mordey, Mr. Alexander Siemens, and Col. R. E. Crompton. Honorary Members representative of all the countries in which a National Committee of the I.E.C. is established are also being appointed.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

### THE SENGHENYDD COLLIERY DISASTER

THE Home Office inquiry into the circumstances of the explosion which occurred in the Universal Pit, Senghenydd, South Wales, on October 14th last, has been continuing during the past month, and some interesting evidence has been given by electrical experts since the matter was referred to in our section on "Electrical Engineering in the Mining and Metal Industries," of February 5th (page 79). On Thursday, February 5th, the possibility of sparks from the signal wires causing an ignition of gas was further investigated. Mr. C. Wadden, the Colliery Electrician, stated that they had never used a pressure higher than 9 volts on the signal circuit, which he did not believe could cause an explosion; he regarded 18½ volts, however, as dangerous. Mr. W. Schielbach (Consulting Engineer) agreed that 9 volts could not cause an explosion, but in view of the fact that an ignition had been obtained with 11·9 volts, would recommend a lowering of the voltage. During the luncheon interval experiments were performed by Prof. W. M. Thornton (Armstrong College, Newcastle) to show that if a bell were shunted with a high resistance bye-pass, all danger of ignition was removed. In these experiments a pressure of 11 volts was used, and a mixture of town gas was fired as soon as the bye-pass was removed. The most important witness of the day was Mr. C. P. Sparks, Consulting Engineer, who gave it as his opinion that the use that they were making of electricity in the pit could not be responsible for the explosion. If the explosion had originated in the bell-box, the covering of the coils would have been singed; but this was not so. He then proceeded to give a full account of the tests that had been made on January 1st and January 27th at New Tredegar to ascertain the degree of danger of ignition there was from signalling circuits of various voltages under various conditions.

The first series of tests was made with bells in an explosive 10 per cent. mixture of fire-damp, obtained from the Cymmer Pit. Tests with 6 and 9 "Dania" cells, 9 and 13½ volts respectively, failed to ignite the gas when these cells were connected to the bell circuit without any resistance equivalent to signal wires. In the nine cell tests the current in the bell was 1·64 amperes maximum, as compared with 1·1 ampere at 9 volts in ordinary working. In the next tests a 10 per cent. mixture of town gas and air was used, which was immediately ignited by the bells from the Senghenydd Pit and New Tredegar rescue station with 13½ volts without signal wire resistance. Tests with the fire-damp mixture were then made with higher voltages, and ignition was obtained with 18 volts on the eleventh attempt, and with 22½ volts on the ninth attempt. Further tests with several different bells with 9, 10, and 12 volts were made, but in no case was the mixture fired, although the bells were kept ringing continuously for over 19 minutes. Another series of tests was made with No. 11 S.W.G. galvanised iron signal wires suspended vertically in the testing chamber; 13½ volts were used, and a continuous series of intermittent contacts were made between the signal wires with an iron knife edge, and after 30 or 40 seconds the mixture was ignited in one case, and after 14 minutes in another case. Similar tests at 9 to 12 volts with the Senghenydd bells failed to ignite the mixture, although carried on for nearly two hours; but in one case with 12 volts on the New Tredegar bell, ignition was obtained. It has been pointed out, however, that the tests with New Tredegar bell have little bearing on the inquiry, as it is of a different type from those used at Senghenydd. In all the tests the conditions were such as to secure maximum conditions of sparking with a given pressure. It will be seen that in no case was ignition of fire-damp obtained with a pressure lower than 12 volts for the signal wire experiments or 15 volts for the bell experiments, although the town gas mixture ignited more easily.

Mr. Sparks was satisfied from these experiments that the working pressure of 9 volts was insufficient to cause ignition of fire-damp, but agreed that the matter should be further gone into in the interests of safety, as this class of risk was not sufficiently fully realised. He recommended an alternating current system of signalling as safer still. Dr. Thornton then gave evidence to the effect that fire-damp was about twice as difficult to ignite as house gas. By the use

of a bye-pass to the bell the danger could be reduced to a negligible quantity without affecting the ringing of the bell. The present regulation fully met the case for safety; if open sparking were prevented it would be perfectly safe. [In this connection it may be remarked the present rules throw the onus on the management of deciding at what point "open sparking" becomes dangerous. Under the old rules for signalling apparatus, 15 volts were allowed under all conditions.]

On the following day Mr. Robert Nelson (H.M. Electrical Inspector of Mines) was called, and described his inspection of the electrical apparatus in the pit, and also referred to the New Tredegar experiments. In these they had not succeeded in getting an ignition with the conditions which were the actual conditions at Senghenydd. He held, however, that there was not sufficient evidence to show that 9 volts was beyond danger, and that the margin of safety between 9 and 18½ volts was altogether inadequate. His view was emphatically that in parts of a mine where naked lights were prohibited, all electrical apparatus should be completely enclosed, so that open sparking would be impossible. Questioned on the definition of "open sparking," he said that when the regulations were being discussed, the Committee assumed that any visible spark could ignite gas, but Dr. Thornton had since shown sparks that would not ignite gas, and he himself still mistrusted all sparks that were visible. He thought that in this respect exemption of existing apparatus from the new regulation should be withdrawn, as the old regulation had proved ineffective.

The sittings on February 9th, 10th, and 11th did not deal with electrical matters. On February 12th Mr. Watts Morgan, who took a prominent part in the rescue operations, expressed the opinion that open signalling wires should be prohibited, and that lamp stations should not be permitted underground. Electric re-lighting apparatus should be in charge of a competent man. One of the witnesses on the following day was Dr. W. N. Atkinson (Inspector of Mines), who believed that gas came away from a fall, and was ignited by a spark from the electric signalling or from falling stones or rocks. Pending further investigation, he would prohibit the use of a signalling voltage above five or six. The hearing of evidence was conducted on February 13th, but representatives of various interested parties addressed the Commissioner and the Assessors at the Home Office on February 20th. Among these, Mr. Brace, speaking for the South Wales Miners' Federation, took the opportunity of airing his well-known views that electricity should not be permitted for hauling, signalling, or lighting unless surrounded by the most rigid safeguards. He submitted, however, that electric lamps should be in general use in all dry and dusty mines. Mr. Nicholas, for the Miners' Federation, said that he failed to see why those combatting the theory that the signalling wires could have caused the explosion should have gone to the great trouble of demonstrating that the signal wires were not in use. He did not think that the court could be satisfied as to the voltage in use at the colliery; open sparking ought to be more clearly defined. The Hon. Trevor Lewis, who appeared for the manager, submitted that on the evidence of the voltage and the tests, there was no risk of open sparking. The inquiry then terminated.

**The Need for Electric Safety Lamps in Mines.**—One of the proposals considered and adopted at the meeting in Cardiff at the beginning of last month of the Miners' Federation, with the object of inducing the Government to amend the law so as to provide further protective measures against accidents, was worded as follows:—"That we press for the use of electric lamps in mines, provided that a gas testing-lamp is available for use in every working place." The congress was presided over by Mr. W. Brace, M.P., who referred to the matter in Parliament during the debate on the Address on Feb. 12th in connection with the amendment dealing with mining and railway accidents. He then pointed out the great drawback to a miner was the lack of light wherewith to defend himself. The electric lamp, however, while it gave a better light, failed to discover the gas, hence a certain number of oil gas testing-lamps must be used as well. Another proposal seeking to prohibit the use of electricity for motive power in mines is dealt with in another column.



## MINERS' SAFETY LAMPS

THE design and maintenance of miners' electric safety lamps were treated in a Paper which Mr. F. J. Turquand read to the London Branch of the Association of Mining Electrical Engineers on February 6th. The Paper was briefly discussed, and will be further discussed at the other branches of the Association. Among the advantages of aluminium alloys, said the author, they did not rust, and acid corrosion was not so injurious to the battery, while the sulphates were easily and permanently removed by cold water. A thick casting did not dent or distort so easily as steel, and could be remelted if required. The alloys were not, however, hard enough to provide friction surfaces or fastenings, but brass, gunmetal, or steel pieces could be cast on, and would remain tightly fixed owing to the relative contraction of the various metals. The usual method adopted to protect the lamp-bulb was to mount it on spring-, air-, or rubber-cushioned contacts. The surrounding glass should be as thick and strong as possible. The dome-shaped glasses generally used had the advantages of strength and of leaving only one edge to seal against leakage. The author continued: "When using blown glasses of this description purchasers should be careful to have thoroughly annealed glass, as only when this is properly done can the glass be safe to use. It is an interesting fact that if one takes a badly annealed dome-glass and just shakes an ordinary tin-tack about inside, it will crack badly. When the right quality of glass, properly annealed, is used, however, it is sometimes difficult to smash a dome glass with a hammer." There were broadly, he said, three methods of holding the glass dome on to the base of the lantern, viz., (1) by pressure upon the dome; (2) a flange cast round the base of the glass, or (3) by cementing a metallic ring on to the edge of the glass, which ring could be screwed or otherwise attached to the case of the lamp. When it was thought desirable to convert the dome top into a lens, that could be effected by either thickening the glass in casting or blowing, or using a glass cylinder with a lens cemented or otherwise attached to the top. It was said to be possible to obtain slightly clearer glass in cylinder form, like the oil-lamp glasses, than in the dome-shape, which was blown into a mould.

The author dealt with the action and construction of primary, lead, and alkaline batteries, and with regard to the design of the battery case, usually made of transparent celluloid, his experience emphasised the importance of providing a substantial base to the cell in all cases where this was removed from the outer case for charging, and also the use of resilient material for supporting the electrodes in the cell rather than the celluloid or ebonite feet frequently employed. He estimated the average life of a secondary battery in a miner's lamp in practice at about 500 charges and discharges—about twelve months. The main points in erecting a miner's electric lamp charging and repair installation were: (a) A supply at constant voltage through a properly erected and maintained circuit; (b) accurate circuit and testing volt- and ampere-meters, including a main-circuit recording volt- and ampere-meter, which should be recalibrated periodically, and have frequent sub-section fuses; (c) strong benches and charging racks completely covered with stout lead or glass sheet; (d) facility for washing down with a hose and quick drainage. It had been found from experience that the average life of 2-volt metal filament lamps was 600 burning hours—or when working four shifts per week, about three months—and that it was desirable to test all the bulbs individually through a long scale ammeter. Lamps should also be periodically tested for c.p. and voltage on closed circuit at the expiration of an ordinary shift.

Most of the lamps now available have been described in *ELECTRICAL ENGINEERING*, but in addition the following lamps have recently passed the Home Office tests:—The T.K. lamp, supplied by the General Electric Co.; the Varta lamp, supplied by the Cremer Lamp and Engineering Co., of Leeds; and a new form of Stach lamp fitted with a flame gas detector.

In the T.K. lamp the glass dome, which stands on rubber, is secured by an inverted truncated cone-shaped ring fitting the dome at the lowest part of its curve. To lessen the effect of upward or downward blows, two of the four pillars which hold down the metal ring pass through the roof of the connection chamber and are fixed by rubber-cushioned nuts. The other two pillars rest on cushions in recesses on the top of the connection chamber. By the use of fine-bore tubes the gases can escape, while the small amount of fluid contained in the tubes drops into a non-spillable drainage chamber. The fluid can be squeezed back into the battery when it is inverted. The Varta lamp has a stout, seamless, stamped-steel case with vertical ribs. The grooves for locking the lamp and securing the battery are also pressed in the case. A stamped-steel lamp-top, strengthened at

the joint, which, when greased, is watertight, a screw-cap bulb with terminals and wires wide apart, contact plates on the rotating cover, and a circular celluloid battery case with rubbered interior. Planté positive and pasted negative plates are used.

The alkaline battery miners' lamps now, or about to be put, on the market, said the Author, were the Wolf, Edison, Woranop, and the G.E.C. The Worsnop lamp uses the Alkum accumulator (*ELECTRICAL ENGINEERING*, Nov. 7th, 1912, p. 625, Vol. VIII.). The lamp case is of steel. A lens above the lamp-bulb gives a concentrated beam. A screw switch is provided. In the new type of Wolf lamp a pressed-steel case is used. The battery case is of sheet nickel. The lamp-glass is cylindrical, and a shunt resistance, which is thrown into circuit should the lamp be broken, does away with the possibility of gas ignition due to the glowing filament.

During the discussion Mr. W. Maurice (General Manager, Hucknall Torkard Colliery, Notts) expressed the opinion that the dome glasses were almost invariably streaky. His impression was that the rotating switch-plate form of switch was being adopted, to the almost total exclusion of other types. He could not agree that the life of accumulator lamps was about 500 shifts. A life of about half this was usually obtained. The alkaline cells with which he had had to do had not given the life expected, as it was found in practice that the iron in the electrodes became oxidised if the level of the electrolyte was allowed to fall. The portions oxidised became and remained ineffective. He thought that the figure of 2,000 charges and discharges given in the Paper was much too high. Mr. Haslam said that in Germany, he believed, great trouble had been experienced with aluminium cases owing to salt water in the pits. The method suggested of casting on brass, gun-metal, iron, or steel rings was not satisfactory. Dome glasses, he said, could be obtained which were quite as clear as any cylindrical glass. There was not the slightest doubt that the screw-top switch was gradually being eliminated, and it would not be very long before all the lamps underground had the revolving top or sliding contact. He had found that positive plates lasted between 8 and 12 months, negative plates about twice as long, but the casing lasted until destroyed by human agency.

During the discussion at a meeting of the North Stafford Branch of the Colliery Managers' Association and the Lancashire, Cheshire, and North Staffordshire Branches of the Association of Mining Electrical Engineers on February 14th at Stafford, Mr. Wm. Maurice said that if a lamp passed the official test and became approved, it was by no means a guarantee that it was sound enough for a colliery to adopt. The mechanical test was only a drop test, and it was not required that the battery be in the case at the time that the test was made. Although it was possible to make a lamp as light as 4 lb. in weight which would pass the Home Office tests, such lamps would be fairly costly in renewals. A lamp of 5 lb., which was a fair average weight for well-constructed lamps, was found in practice not to be objectionally heavy. He urged that the only safety device required was that inherent in careful design, suitable material, and first class construction, since it was now definitely established that a spark at 4 volts was quite safe, and that 10 or 11 volts was perfectly safe for main road signalling. Dr. Lister Llewellyn agreed that an extra pound or two in weight made little difference, but it was important that the light be as much as possible, as in the better illumination of mines lay the remedy for miners' nystagmus. Colliery managers must not be disappointed if nystagmus still occurred in the next few years, because there were probably latent cases which would develop, but he hoped that with the introduction of these lamps permanently the disease would become almost negligible.

**Telephones and Home Office Rules.**—Some mines have misinterpreted the Home Office Rule which provides that "where electricity is used for signalling, the pressure in any one circuit shall not exceed 25 volts," and have thought that it applied to telephones in mines. The matter has been taken up by the Telephone Manufacturers Association, and we are officially informed that the Rule relates only to signalling, and not to telephones.

**Large Ilgner Winding Set.**—The North Butte Mining Co. has ordered an Ilgner winding set for its new Granite Mountain shaft. According to the *Electrical Review* and *Western Electrician* (Chicago), this will be the largest electric winder in America, and one of the largest using the Ilgner system of power equalisation in the world. The winding motor will have a maximum intermittent rating of 4,500 h.p. at 71 r.p.m., and the motor-generator set will be driven by an induction motor of 1,400 h.p., continuous rating. The flywheel will weigh 50 tons. The winding drums will be 12 ft. in diameter, and the rope  $1\frac{1}{2}$  in. in diameter. The rope speed is to be between 2,700 and 3,000 ft. per min., and the skips will hold seven tons. The shaft will ultimately be 4,000 ft. deep, and the winder will deal with 200 tons of mineral per hour from this depth, or 300 tons from the 2,000-ft. level.

## ELECTRIC PUMPING PLANT AT A KENT COLLIERY

A PAPER by Mr. H. J. Wroe, read before the London Branch of the Association of Mining Electrical Engineers on February 6th, described the electric pumping plant which was installed at the Tilmanstone Colliery, East Kent, for coping with water during sinking operations, to replace the original steam pumps which were not of sufficient capacity. The increase in the amount of water and the bursting of two pipes in the delivery column of the original pumps had resulted in the shafts becoming flooded to the 600-ft. level. The electrical pumping plant put in for unwatering the shafts consisted of a horizontal Sulzer centrifugal pump direct-coupled to an A.E.G. 8,000-volt three-phase 50-cycle motor in an inset at the 600-ft. level, provided with suitable waterways and cable ducts, and two Sulzer four-stage centrifugal sinking pumps, each capable of delivering 1,200 gallons of water per min. against a head of 870 ft., suspended in the shaft on steel-wire ropes. Each pump was coupled by an elastic coupling to a totally enclosed three-phase squirrel-cage motor, capable of developing at 8,000 volts 50 cycles a continuous output of 500 b.h.p. at a synchronous speed of 1,500 r.p.m. The upper bearing of the motor carried the weight of the rotor, the weight of the pump shaft and impellers being taken by a step bearing on the pump.

The leading characteristic of the motor design was the combination of air and water cooling, the rotors being fitted with fans which equalised the temperature in the interior of the motor, and prevented the formation of heat pockets. The stator windings were water-jacketed. The control of the fixed horizontal pump and of two sinking pumps was carried out from a switchboard mounted in the 600-ft. pump room, consisting of ten switch pillars built of sheet-steel and totally enclosed. Three of these were feeder pillars; one was provided for the horizontal-pump motor, and two pillars for each of the sinking-pump motors. The two remaining pillars were provided for motor drying-out, one being occupied by the necessary switchgear, the other containing a 150-k.v.a. step-down transformer fitted with tapings on the low-tension side. Each sinking-pump motor was started by its own transformer, contained in a separate pillar, the adjoining pillar being provided with an oil-switch, isolating links and instrument transformers. The oil-switch was also fitted with overload and no-volt releases (the latter being interlocked with the starting transformer), and further with an emergency stopping switch fixed on the frame of the sinking pump. Owing to these interlocking connections, it was impossible to close the motor oil-switch unless the starting transformer was in the starting position; but in case of emergency the motor could be stopped instantly by opening the emergency switch fixed on the frame of the sinking pump. The breaking of the emergency switch trips the oil-switch on the pump-room switchboard. The cables for the sinking-pump motors were carried from the switchboard along the water ducts to the cable drums, connection to the latter being made through slip-rings mounted on the cable-drum shafts. The pilot cable for stopping either sinking-pump motor was also carried in a similar manner to a small cable drum. Some considerable difficulties were introduced, due to the very sandy character of the water, which caused rapid wear of the working parts of the pumps.

Operations with the electric sinking pumps were confined to No. 2 shaft, and when the water had been lowered sufficiently, the steam pumps at the 1,140-ft. inset were recovered, and were set to work. Meanwhile a new inset was made from No. 3 Pit at the 1,140-ft. level, and three electric pumps with suitable switchgear were installed. These pumps, also supplied by Sulzer Bros., were of a special horizontal stationary six-stage type, each rated for at 1,000 gallons per min. against a head of 1,300 ft.

Each pump was coupled by an elastic coupling to a three-phase ventilated enclosed 8,000-volt 50-cycle slip-ring motor, with a continuous output of 680 b.h.p. at a synchronous speed of 1,500 r.p.m. The motor was started by a liquid starter, and the bearings are ring-lubricated and water-cooled. The switchboard was very similar to that at the 600-ft. inset, and consists of three feeder panels, three motor panels, one spare motor panel, one transformer panel containing a 150-k.v.a. step-down transformer, and one transformer switch-panel.

When the coal measures were reached, the water was

tubbed out of the shafts, and then the conditions for the pumps improved greatly. The quantity of water to be dealt with has since fallen off considerably, and arrangements are being made for altering the pumps, so that one will easily deal with the whole. During the sinking and unwatering operations, which lasted ten months, not a single stoppage of the electricity supply occurred, and, further, the sinking pumps and motors, in spite of the onerous conditions under which they worked, were used alternately in such a way that pumping was carried on continuously.

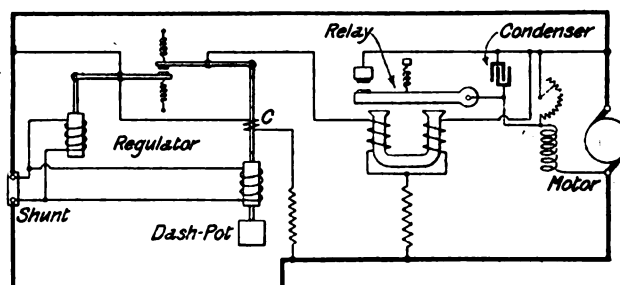
## ELECTRICAL MINING AND METALLURGICAL PATENTS OF FEBRUARY

### Mining.

THE patent specifications published by the Patent Office during February included the following, of particular interest to mining electrical engineers. In No. 2,872/13, T. Attwater (Brighton) describes a safety lamp of light weight. The casing is a cylindrical, aluminium casting, and at the top is provided with an external thread for a split flanged locking-ring fitted with a clamping screw worked by a key. Two or three incandescent lamps are mounted on a vulcanite disc base in a glass tube on the outside of which is a metallic cage integral with the top cover plate, and a lower flange and ring supporting the vulcanite base. Two spring terminals are provided, and the switching is done by a push switch by means of a plunger passing through the casing. In No. 28,634/13, Bickford, Smith & Co., Ltd., and W. N. B. Smith (Cornwall), claim a blasting fuse in which the firing wire passes through a hole bored transversely through the fuse and passing through its axis. The hole is filled with a priming material and covered with a waterproof insulating material.

### Metallurgical.

The following patents are of special interest to electro-metallurgists. In specification No. 22,159/13, A. Hiorth (Christiana, Norway) claims the arrangement in induction furnaces, of the disc transformer type, of one primary coil of smaller and the other of larger diameter than the annular melting bath. The centre line of this lies on the conical surface through the centre lines of the upper and lower



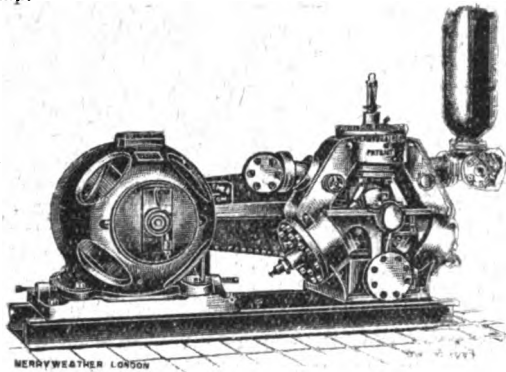
CONNECTIONS FOR ELECTRICALLY-DRIVEN NON-REVERSING ROLLING MILL.

primary coils, so that the surface of the melting bath may be easily accessible. In No. 6,285/13, the British Thomson-Houston Co. claims the control arrangement for non-reversing rolling mills shown in the diagram. By this means, if the current in the shunt rises, the action of the regulator coils will increase so as to cause the contacts to approach and release the relay armatures and short-circuit the rheostat. The field being thus augmented, the current falls and the regulator contacts are again separated. The small coil connected across the motor terminals causes the current regulated by the regulator to be increased or decreased, according to its relation to the coil underneath it. This specification was communicated by the French Thomson-Houston Co. In specification No. 3,046/13 a magnetic separator is described by Bowes, Scott & Western, Ltd., and I. S. Dalgleish (London). The magnet poles are excited by a pulsating or alternating current. The magnetic particles descend by gravity between the successive attractions to the poles. An upper pole is arranged to separate the material supplied, so that it falls in magnetically separated streams, which then come under the influence of a lower pole.

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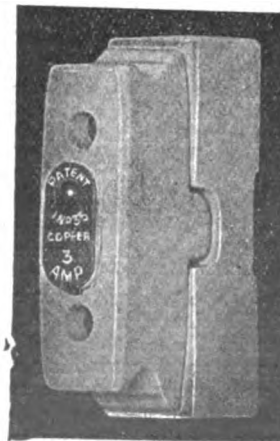
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### ELECTRICITY IN MINES

A PAPER dealing generally with the subject of electricity in mines, by Mr. R. Nelson (H.M. Electrical Inspector of Mines), was read at a meeting of the North Staffordshire Institute of Mining and Mechanical Engineers, on February 2nd. The Paper was addressed particularly to colliery managers, and was to some extent supplementary to a previous communication on the subject. Mr. Nelson, in comparing different systems of distribution, said that, although the cables for a continuous-current system cost about 30 per cent. less than for a corresponding three-phase system, the former system was one of limited range only. The three-phase motor had advantages in respect of cost, better mechanical construction, lower maintenance cost, greater overhead capacity, and, in the case of squirrel-cage machines, no rubbing contacts. On the other hand, continuous-current motors dealt better with a heavy load at starting, and could run economically at varying speeds. The most important requirements for safety in working electrical plant underground were: Strong metallic outer coverings for all apparatus to protect insulating material from abrasion, to prevent accidental contact by persons with live parts, and to prevent open-sparking; efficient connection to earth for the metallic outer coverings; and provision for making a faulty circuit dead automatically immediately leakage of current developed. The last mentioned was more conveniently provided for with the three-phase system if the neutral was earthed. Finally Mr. Nelson expressed the opinion that "with the appliances in present use, three-phase working appears to possess substantial advantages over continuous-current working." In the last portion of his Paper Mr. Nelson took the opportunity of urging strongly that the principle of enclosing all apparatus in a strong metallic outer covering should be applied equally to light as well as to heavy apparatus—that is, to the cables and fittings for electric lighting circuits, to telephone and signalling apparatus, and to all cables used in conjunction with such apparatus.

In the course of the discussion most of the speakers agreed as to the superiority of the three-phase system, although some successful continuous-current installations were referred to. On the other hand, the earthing of the neutral was objected to by Mr. J. R. L. Allott, because if anything happened on one phase he could keep going, whereas if the neutral were earthed, he would have to stop the pit while it was put right. Mr. Nelson in his reply denied that this was a real disadvantage, and strongly objected to running with a fault on the system. Mr. J. Gregory, however, asserted that it was not essential to earth the neutral to provide for opening the circuit in case of leakage. He also referred to the unsuitability of the squirrel-cage motor for haulage, and was about to experiment with epicyclic gearing for taking up the load gradually.

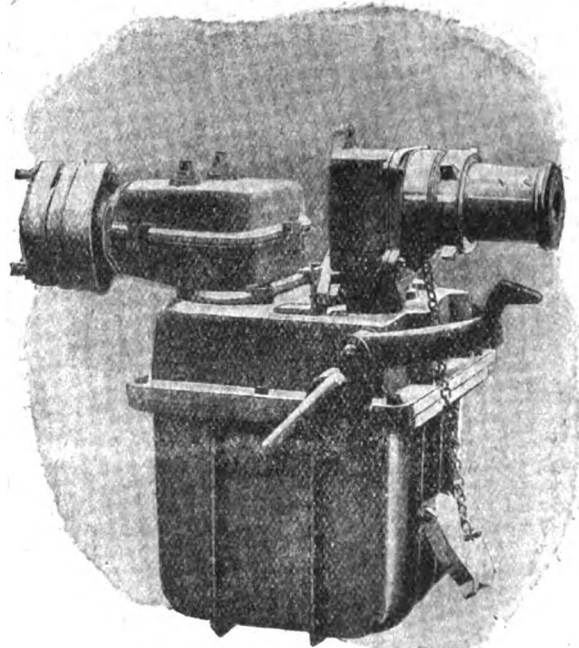
### THE CAMPAIGN AGAINST ELECTRICITY IN MINES

AT a meeting of the Miners' Federation at the beginning of last month, under the Presidency of Mr. W. Brace, M.P., a number of proposals with the object of inducing the Government to amend the law in order to secure further protective measures were discussed. Sixteen proposals were adopted (one of which, dealing with electric safety lamps, is referred to in a note in another column), but the most serious, from our point of view, a proposal to prohibit entirely the use of electricity in mines, was deferred for further consideration at the annual conference of the Federation this month. Mr. Brace, who is carrying on an active campaign against electrical working in mines, found a further opportunity of expressing his views in the course of the debate on the Address in the House of Commons on February 18th in connection with the amendment proposed by him regretting that no mention was made in the King's speech of the "serious and increasing number of accidents in mines and on railways, and that no action for dealing therewith is proposed." After dealing with a number of other mining matters, Mr. Brace urged that with the introduction of electrical working, a "tremendous risk" was brought into the mines, and quoted a remark of the late Mr. Pickering that electricity had brought a new danger into the mines of the country. He referred to the disasters which had occurred during the last five years, and without further argument asserted that "when electricity was not used in the mines these terrible disasters did not take place." He even instanced the Senghenydd accident, which has by no means been proved to be due to electrical causes. Continuing, he said "we had become, long before electricity was introduced, per head of the population, the greatest coal-producing nation in the world, and there is really no industrial reason why electricity should be used in our mines." Mr. Ellis Griffith (Under-

Secretary for the Home Department) reminded Mr. Brace that the Senghenydd disaster was still under investigation, and he could express no opinion on it. "The controversy is," he continued, "whether, for the sake of the safety of the mines, electricity should be used or not. My Hon. Friend thinks it should not, but I can assure him that a great many people take the contrary view. The Senghenydd inquiry will do something to throw light on the question." The amendment was lost.

### AN EXPLOSION-PROOF GATE-END SWITCH

WE are able to illustrate here, by the kindness of A. Reyrolle & Co., Ltd. (Hebburn-on-Tyne), a pattern of gate-end switch which they manufacture in large quantities for underground work. The apparatus consists of one of their standard three-phase, 500-volt, 50-ampere, explosion-proof, oil-break switches, combined with a dividing box, with gland for armoured cable at one end, and at the other end there is fixed a watertight plug and socket. The plug is interlocked with the handle of the switch, so that the plug



EXPLOSION-PROOF GATE-END SWITCH.

cannot be withdrawn or inserted while the switch is in the "on" position. If necessary, the switch can be used as a gate switch, and can be fitted with either a watertight plug at each end or a dividing box at each end, instead of one box and one plug, as shown. Also, the dividing boxes can be vertical or horizontal type. The whole arrangement is very compact, and, at the same time, is sufficiently strong mechanically to withstand rough usage. They are issuing a pamphlet (No. 193) dealing with this switch, and will be happy to forward copies to any of our readers on hearing from them.

**Electricity in Coal Mines.**—We have received from the British Thomson-Houston Co., Ltd. (Rugby), a copy of a very finely produced and illustrated pamphlet on Electricity in Mines, a subject in which the Company have a large amount of experience. In addition to interesting descriptive reading pointing out the tendencies of modern electric mining practice, there are many illustrations showing features of actual installations carried out by the B.T.H. Co. These include steam turbo-generators and switchboards in colliery power stations, special mining substation switchgear, electric winding plants (with and without flywheel load equalisation), motors and special gearing for driving screening plant, main rope surface haulage plants, underground main and tail and endless rope haulage gears, electrically-driven pumps, &c. The special types of mining induction motors illustrated, with attached trifurcating boxes, enclosed slip-rings, and ventilated stators, are particularly interesting, and the whole publication, besides pleasing the eye, gives a good idea of the thoroughness with which the Company have dealt with the special problems involved in mining electrical engineering.



## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Feb. 26th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in *italics* indicate communicators of inventions from abroad.

2,836/13. **Enclosures for Projector Arcs.** H. AYRTON. The enclosure, or "lamphouse," is made of wire gauze or perforated metal with asbestos or similar cover. This may be attached to the gauze, close to it, or is preferably stretched on a frame at some distance. By this means the interior of the enclosure is kept cool, with ample, but symmetrical, ventilation. Two figures.

4,926/13. **Magazine Arc Lamps.** J. BROCKIE and JOHNSON & PHILLIPS. Each magazine has a double carbon holder movable in the plane of the magazine, so that it can be brought automatically into position opposite the next pair of carbons for duty, while the stumps of the previous pair are still burning. Four figures.

5,150/13. **Malleable Tungsten.** J. CANELLO. The finely divided metal is mixed with a small quantity of nickel, together with glycerine, to act as a binding agent. The mixture is then compressed, slowly dried, and afterwards sintered in an electric furnace. The furnace is water cooled. Two figures.

8,173/13. **Printing Telegraphs.** H. KAEHLER and P. KAEHLER. This apparatus is a combination of parts of the Hughes and Murray. Broadly, a type-wheel apparatus is used for receiving the impulses sent by type-wheel apparatus operated by hand or automatically. The receiver is so constructed that simultaneously a strip is perforated and a telegram printed. The strip is suitable for automatic delivery or transmission in a corresponding apparatus, and the printing and perforating devices are mechanically connected, and the perforated strip provided with holes, whose distances apart correspond to any suitable scale to the distances between the signs on the type-wheel represented by the holes. Seven figures.

11,540/13. **Detecting Icebergs at Sea.** F. KRÜGER. Heat radiated from the iceberg is focused by a concave mirror on to a surface thermopile, or surface bolometer. This is connected to a moving coil, electro-magnetic Wollaston wire, or similar galvanometer, such as an Einthoven galvanometer.

15,728/13. **Recording Instruments.** SIEMENS BROS. (*Siemens & Halske A.-G.*). Rows of different characters are arranged across the path of the record strip, and adapted to be changed intermittently, so that the various values are recorded by different types of signs. Seven figures.

16,890/13. **Railway Signal Interlocking.** SIEMENS BROS. and W. E. SCOURFIELD. The locking bolt is capable of moving, relatively to the armature of the controlling magnet, to or from its operative position, whilst the armature is held by the magnet. The locking bolt is mechanically thrust positively into the locking position at each movement of the locking bar. Two figures.

18,517/13. **Insulating Conductors.** J. A. HEANY. Fibrous insulation, such as asbestos, is applied to conductors as a smooth uniform sheath. This is effected by covering a thread or filamentary body with a coating of the fibres, using an adhesive binder, and winding this on the conductor, and finally smoothing. Three figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** BROCKIE and JOHNSON & PHILLIPS [Contacts] 4,927/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** OTIS ELEVATOR CO. (*Otis Elevator Co.*) [A.C. motor control] 3,249/13; B.T.-H. CO. (*G.E. Co., U.S.A.*) [Insulation] 3,271/13 and 3,566/13; [Motor control] 3,565/13; LEE and OLDFIELD [Vehicle lighting] 7,286/13; WIDEGREN [Duplex working of apparatus at a distance by pulsating current obtained from direct] 29,240/13.

**Dynamoes, Motors, and Transformers:** LJUNGSTRÖM and WIDSTRÖM [Commutator machines] 4,773/13; BROOKS & HOLT, 15,697/13; RICHARDSON [A.C. rectifiers] 19,668/13.

**Ignition:** BIDDLECOMBE and THOMAS, 28,513/12.

**Instruments and Meters:** GARSIDE [Prepayment] 7,853/13; HARTMANN & BRAUN A.-G. [Multiple recording] 27,348/13.

**Switchgear, Fuses and Fittings:** BURSTYN [Suppression of the

arc at break] 3,882/13; COOPER and BARLOW [Lift and crane controller] 4,869/13; GROVES [Magazine fuse-box] 6,861/13.

**Telephony and Telegraphy:** WILLIAMS [Cable signalling] 788/13; MARCONI [A.C. production] 802/13; AUTO. TELEPHONE MFG. CO. (*Auto. Elec. Co., U.S.A.*) [Telephony] 3,339/13; GRUBB and BOUVERIE [Communication between moving stations] 3,766/13; STERLING TELEPHONE & ELEC. CO. and BELL [Intercommunication telephony] 4,396/13; GELL [Automatic telegraph apparatus] 14,407/13; SCHIESSLER [Telephone relays] 15,179/13; REEVES and LUNDELL [Automatic telephone exchanges] 15,579/13.

**Traction:** ALEXANDER (*Union Switch & Signal Co.*) [Governing speed of trains] 8,245/13; WALLACE and MACEY [Trolley collectors] 20,284/13.

**Miscellaneous:** HARDY [Automatically opening gates] 6,289/13; BARRON and HUDSON [Closing railway carriage doors from guard's van or engine] 8,611/13; MASCH. A.-G. BALCKE [Air filters] 13,353/13; DAVIS [Submarine lamps] 21,115/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** DEUTSCHE GASGLÜHLICHT A.-G. (*AUERGES*) [Metal vapour] 15,046/13; SIEMENS SCHUCKERTWERKE GES., 23,188/13.

**Dynamoes, Motors and Transformers:** SCHERBIUS [Current transformation] 2,822/14; [Arrangement of valves] 3,169/14.

**Electrometallurgy:** LESCURE [A.C. furnace for treating molten metals] 3,291/14.

**Switchgear, Fuses and Fittings:** MURRAY [Cut-outs] 17,345/13; THODER & CO. [Automatic switches] 2,903/14.

**Miscellaneous:** SOC. D'ÉLECTRICITÉ MORS [Signalling] 2,741/14; O'KEENAN [Clock synchronising] 2,924/14; SOC. INTERNATIONALE DE LUMIÈRE FROIDE (PROCÉDÉS DUSSAUD) [Lighting apparatus] 3,067/14; BAUER, [Combined tail-light and signal for automobiles] 3,140/14.

The following Amended Specifications may now be obtained:—

**Incandescent Lamps:** C. D. ABEL (*Siemens & Halske A.-G.*) [Filaments] 20,277/04.

**Miscellaneous:** C. ABEL-MUSGRAVE [Radio-active emanations] 21,462/11.

### Opposition Entered to Grant of Patent

9,388/13. **Lamp Cartons.** C. H. FOYLE and BRITANNIA FOLDING BOX CO.

### Petition for Extension of Term of Patent

12,431/00. **Extraction of Liquid from Solids by Electro-Osmose.** G. B. SCHWERIN. Mr. Justice Warrington has directed that the petition of the patentee and of Elektro-Osmose A.-G. for an extension of term of this patent be heard not before June 23rd.

### Lapsed Patent Restored

5,522/07. **Electro-Magnetic Separator for Grain Conveyors, &c.** JAS. HAWLEY, LTD. and A. S. JONES. An order has been made restoring this Patent, which lapsed owing to the non-payment of the renewal fee.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** T. L. CARBONE [Magnetic blow-out in form of a ring] 24,859/02.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H. CO. (*G.E. Co., U.S.A.*) [Sectionalised distributing system with automatic section protection] 24,181/04; P. MACGAHAN [Duplex conductors] 23,007/08.

**Electrochemistry and Electrometallurgy:** C. N. RÜBER [Calcium chloride and phosphates] 24,891/07.

**Ignition:** R. F. HALL [Sparking plugs] 20,507/00; W. MULHOLLAND, 24,403/08.

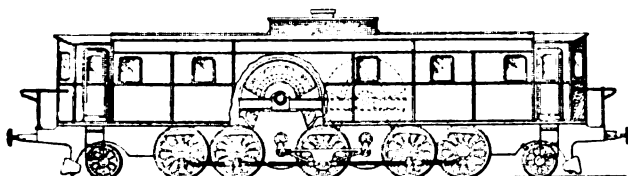
**Switches, Fuses and Fittings:** P. KENNEDY [Regulating switches for train-lighting equipments] 17,314/05; A. P., G. C. and P. A. LUNDBERG [Tumbler switch for starting induction motors] 24,058/08; P. L. DE JARNY [Chains for lighting fittings] 24,263/08.

**Traction:** N. C. E. FLAMAN [Recording on train position of all signals passed] 24,094/08.

**Miscellaneous:** E. HOLLINGSWORTH (*H. Wyman, Crompton and Knowles' Loom Works, U.S.A.*) [Stop motions for looms] 24,899/02; F. BRAUN [Baths] 25,187/07.

## ELECTRIC TRACTION NOTES

In addition to his Paper, "Motor and Control Equipments for Electric Locomotives," read and discussed at the Institution of Electrical Engineers last Thursday (see *ELECTRICAL ENGINEERING*, February 26th, p. 117), Mr. F. Lydall presented a short Paper entitled, "Electric Locomotives." This was supplementary to the Paper published in the *Institution Journal* last November (see *ELECTRICAL ENGINEERING*, November 13th, 1913, p. 633). Four or five new designs were described. We illustrate the latest locomotive for the Loetschberg Tunnel Railway. It now appeared, said the author, that, for high- or low-pressure D.C. locomotives for shunting or freight work at speeds customary in this country, the articulated bogie principle, with four geared motors suspended on the bogies in the ordinary way, was the best. For A.C. railways the choice of drive was more open. There was a tendency towards concentrating the motive power in one or two motors, and this necessitated the use of connecting



rods on one system or another. The Siemens locomotives of the 1-C-1 type (i.e., one pair of leading wheels, three pairs of driving wheels, and one pair of trailing wheels) for the Wiesenthal Railway had been found to give trouble due to mechanical resonance at a speed of about 36 km. per hour. Some alterations had been made, and the trouble overcome. The two motors still drove the jack-shaft, which was between two of the three pairs of driving wheels, by side connecting rods. Similar vibratory effects had also been noticed on many other railways where coupling-rod systems were used, and these effects were especially noticeable in those cases where a pair of motors was coupled to a single jack-shaft, or where a pair of motors was rigidly coupled together by any arrangement of connecting rods. There was at present a tendency on the Continent, and, the author believed, in the United States, towards the use of gearing rather than connecting rods for transmitting the torque to the jack-shaft, or direct to the driving axles.

In the course of his remarks Mr. Roger T. Smith (Chief Electrical Engineer, G.W. Rly.), who opened the discussion, said that electric locomotives would supplant steam locomotives in this country, not so much on the question of economy as because they could do what the steam locomotives could not. For instance, in taking mineral trains from the "hinterland" to the coast the electric locomotive, for running at 35 m.p.h., was the lighter, and could haul a complete load of empty trucks up the gradients met with, whereas two steam locomotives were required for this work. With regard to acceleration, in the A.C. system every notch on the controller was a running notch, and so the difficulty of the slipping of the wheels, which might arise on D.C. locomotives, was not present, as the driver could wait on any notch for the conditions to change. Mr. F. W. Carter (B.T.H. Co., Rugby) did not think that the Paper was critical enough of the different types. He pointed out that weight at the end of a locomotive was conducive to nosing and allied defects. Side rods, he said, were the cause of a great deal of trouble, and jackshafts were worse. Mr. J. Bowden (Met. Rly., Neasden) favoured the use of side rods. He asked the author several questions. Mr. J. B. Sparks showed some slides on behalf of Mr. Theodore Stevens, and pointed out that D.C. motors could be built for pressures up to 1,200 or even 2,400 volts or more, against 300 volts for single phase. Thus the current handled would be greatly reduced, although the number of contactors required was greater. The cost of D.C. locomotives appeared to be only about half that of single-phase locomotives. Dr. S. P. Smith (City and Guilds Engineering College) said that for equal outputs high pressure D.C. and ordinary single-phase motors were about equal in weight. The author replied briefly to some of the points raised. He pointed out that as the conditions varied so much, the cost of A.C. and D.C. locomotives varied from £35 to £120 per ton.

Reference was made to the electrification scheme at the annual meeting of the London & South Western Railway Co. last week. The work on the first three sections of the line, viz., from Waterloo to Kingston, Twickenham and Richmond, and back to Waterloo; the Hounslow loop and the Wimbledon

line via Southfields, is being pressed forward, and it is hoped that one of them will be ready for the running of electric trains before the end of this year. The Chairman also stated that the whole of the contracts in connection with this work have been placed with British firms.

At the annual meeting of the London, Brighton & South Coast Railway Co., it was stated that the section from Balham, through Streatham Common, Norbury, Thornton Heath, Selhurst, West Croydon, to Wallington, will be converted to electric traction at the end of this year. The whole of the conversion of the suburban lines is expected to be completed within four years. Since the establishment of electric trains four years ago, the Company has carried, on an average, over 6,000,000 passengers in excess of the last twelve months' period of steam working.

The Board of the Metropolitan Railway Co. has had a very difficult task to secure the consent of the shareholders to its Bill now before Parliament, which provides for the creation of a joint committee of the Great Northern and the Metropolitan Railway Companies to work the Great Northern & City Railway, acquired by the Metropolitan Co. last year. One shareholder has been very insistent in his objections, and has demanded poll after poll at the various meetings. The Board, however, has been able to defeat the opposition; but it is now suggested that, inasmuch as the Great Northern & City shareholders' votes have been responsible for this defeat—which the Board denies—the opposition is intending to deposit a petition against the Bill in Parliament.

A report has been prepared relating to the street traffic of Montreal, and a recommendation is made to build subways or tube railways at a cost of some £4,000,000, and new surface tramways at a cost of £2,500,000.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Three Marconi stations have been opened in Spain. These are situated at Finisterre, Santander, and Cape Palos, about sixteen miles from Cartagena. The first of these is to be connected by land-line with Corunna.

In reply to a question in the House of Commons on Monday by Mr. W. Guinness, Captain Norton stated that work on the English base station of the Imperial Wireless chain had already been commenced at Leafeld, Oxfordshire, but the full details of the plant had not been settled. The Egyptian station, for which a site has been purchased about fifteen miles from Cairo, was to be a three-way station, as a suitable site in East Africa for the three-way station originally proposed could not be found. The Marconi Co. were willing to guarantee continuous communication between Egypt and India. The third station would thus be in India in the neighbourhood of Poona. The East African station was, however, still necessary as a link with South Africa, but neither it nor the South African station could be proceeded with until the agreement was ratified by the South African Government. The sites have, however, been provisionally selected. In reply to another question from Mr. Guinness, Captain Norton, referring to the acquisition of the Goldschmidt system by the Marconi Co., said that Lord Parker's Committee had reported that the system was a promising one, and the Postmaster-General would consider its adoption for the later stations of the Imperial chain if proof were forthcoming that it was more efficient or more economical than the Marconi system.

A Local Government Board inquiry was held last week concerning a loan of £192,423 for the purchase of the Post Office Hull telephone system by the Hull Corporation. There was a certain amount of opposition to the proposal, but a large amount of support.

The Mossoul-Bagdad and Alep-Bagdad lines were down on the 25th ult. and repaired on the same day.—The Oran-Tangier communication failed on the 26th ult., and on the 27th the Persian lines between Borazjoon and Behbahan-Ahvaz-Mohammareh-Shushter were restored.—The Amazon Telegraph Co. now accepts deferred messages at half rates on its system, and censorship on telegrams for the Union of South Africa has been cancelled.—A severe blizzard in New York has laid low practically all telegraph and telephone lines, but at the time of going to press conditions were practically normal.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 139. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**GEARING.**—An interesting pamphlet on the advantages of tool steel gears and pinions, including some remarkable examples of their wearing qualities, has been sent us by Scholey & Co., Ltd. (151 Queen Victoria Street, E.C.).

**HEATING AND COOKING.**—Reductions have been made in the prices of some of the "B. & K. Universal" heating apparatus placed on the market about 18 months ago. We are informed by the Brompton & Kensington Accessories Co., Ltd. (254-260 Earl's Court Road, Kensington, S.W.), that, if desired, samples will be sent on "sale or return." The range of articles listed includes toasters, water heaters, boiling rings, tea and coffee pots, chafing dishes, irons, &c.

**SILICA MERCURY VAPOUR LAMPS FOR THE LABORATORY.**—The most recent adaptation of the mercury vapour lamp as an economical source of ultra-violet light adapted for experimental laboratory work for scientific and industrial purposes is described in a new leaflet issued by the Westinghouse, Cooper, Hewitt Co., Ltd. (80 York Road, King's Cross, N.).

**INSULATORS.**—A list of "Viaco" insulators has just been issued by the Electrical Engineering & Equipment Co., Ltd. (109-111 New Oxford Street, W.C.). The insulators are made of a special moulded material, and tests are quoted to show that they possess great advantages over porcelain for telegraph and telephone lines.

**"E.C." JOURNAL.**—In addition to the permanent features of the "E.C." Journal, which is published monthly by the Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.), No. 2 contains short illustrated articles on the A.E.G. large machine shop, and its lighting by means of "Sunshine" long-burning flame arc lamps. The problem of preventing the condensation of moisture on shop windows, the time saved by the use of electrically-driven portable tools for motor-car repair work, and a new single-phase meter, are also dealt with. The permanent features referred to above embrace January quotations of copper, tin, rubber, and lead, and a list of motors in the London stock at the present time.

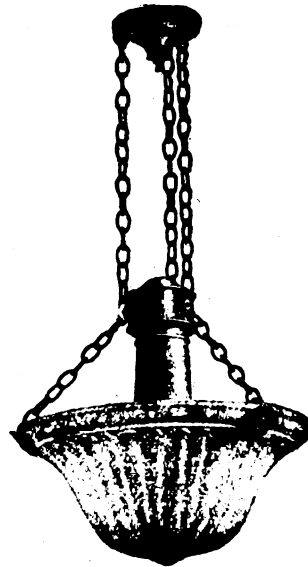
*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**LAMPS.**—A very cleverly contrived folder from the Edison & Swan United Electric Light Co., Ltd. (Ponder's End, Middlesex), shows, through a hole in the front, a hand about to remove an old lamp from a pendant. When the page is turned over the hand withdraws the lamp, to replace it by a Royal Ediswan in the most lifelike way.

Another new folder from the Edison & Swan United Electric Light Co. depicts a drawing-room in which a number of couples are dancing by the light of Royal Ediswan lamps.

**ELECTRIC FIRES.**—Belling & Co. (Lancaster Works, Derby Road, Edmonton, N.) have produced a most effective poster advertising their well-known fires. A lady is seen in bed turning on an electric fire, and a splendid effect of warm glow is obtained by the bold colouring in conjunction with the black background.

**HEATING AND COOKING.**—A new list has been issued by Credenda Conduits Co., Ltd. (Chester Street, Aston, Birmingham), in which the "Credenda" system of heating and cooking apparatus is described. Nickel-chrome ribbon is wound on a mica former for use on apparatus where regulation is required or where strip system is specified. What is known as the "Disc" element consists of an enamelled steel disc, into which is fixed by means of a fireproof cement the insulated nickel-chrome heating wire. The leading out wires pass through bushes of steatite. This element is made to cover the entire bottom of the utensil, and can be removed and replaced very rapidly, if required. The list prices many artistic designs of kettles, various saucepans, warming and boiling plates and grills, as well as a range of ovens, irons, lamp radiators, and convectors. In the case of the irons the construction of the element permits of the heat being applied right up to the toe, and in those cases where regulation is required this is obtained by means of three fire terminals and plugs. The London agents for this apparatus are Baxter & Caunter, Ltd. (219 Tottenham Court Road).



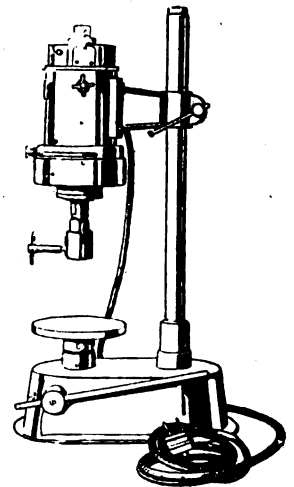
HALF-WATT LAMP FITTING  
WITH ALBA GLASS BOWL.

### SEMI-INDIRECT LIGHTING BY HALF-WATT LAMPS

LAST week we illustrated some designs of semi-indirect lighting fittings for half-watt lamps, which have been put on the market by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.). We now illustrate another, in which the principal feature is an ornamental "Alba" bowl. The half-watt lamp, with its high intrinsic brilliance, should not be used for interior lighting without the light being adequately diffused, and this particular style of glassware is admirably adapted to the purpose.

### SMALL ELECTRICALLY DRIVEN TOOLS

WE have received from Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), a catalogue giving particulars of the range of electric drilling machines and motor grinders, which they are placing on the market. These include portable drilling machines, single- and three-speed, in six sizes, from one-sixteenth h.p. to 1 h.p., for both continuous and alternating current (single- and two- and three-phase), with a complete set of accessories and spare parts; bench drilling machines, single- and three-speed, one-sixteenth to one-third h.p.; pillar drilling machines from one-quarter h.p. to one-twelfth h.p., and lathe- and hand-operated grinding motors. The motors are fitted with ball-bearings throughout, and the weight of the portable types has been kept as low as is possible without serious loss of efficiency and overload capacity. All the drills are suitable for woodworkers as well, and the size of holes in wood may be taken as roughly double that in iron. We understand that the motors are of particularly ample rating in order to withstand the rough usage met with in ordinary working. They are totally enclosed, and the electrical parts are separated from the gearing, so that no grease can percolate into the commutator or windings. All the gear wheels run in grease, by which means friction and noise are reduced to a minimum. For A.C. circuits, induction motors only are used. The self-contained bench drill illustrated here drills up to  $\frac{3}{8}$  in. and is fitted with a  $\frac{1}{4}$ -h.p. motor.



ELECTRIC BENCH DRILL.

**Mazda Daylight Lamps.**—In last week's ELECTRICAL ENGINEERING, page 112, reference was made to some remarks by Prof. Silvanus Thompson at a meeting of the Illuminating Engineering Society on incandescent lamps with specially coloured bulbs giving a light very closely resembling daylight, by which colours of pictures, &c., can be seen in their true proportions. The British Thomson-Houston Co. inform us that the lamps shown on the occasion in question were standard Mazda lamps coated with a special daylight varnish supplied by them. These dipped lamps are supplied at a very slight increase in price, and can be applied to any existing picture lighting fittings.

# OSRAM

## LAMPS

### Important Notice

## JUDGMENT

THE OSRAM LAMP WORKS, LTD., beg to inform the Trade and the Public that on January 26th, 1914, in the High Court of Justice, Chancery Division, Mr. Justice Warrington GRANTED AN INJUNCTION against THE ELECTRIC FITTINGS SUPPLY CO., 169 Highbury New Park, N., and 1 Melson Street, Luton (Proprietor, MORRIS LEWIS), in default of defence, in the action instituted by the Osram Lamp Works, Ltd., for infringement of OSRAM Patents Nos. 23899\* of 1904 and 18622 of 1906 (the validity of which had already been certified by the Court).

The infringement complained of in such action was the sale of

### "VOLT" LAMPS

manufactured by the Metallic Glowlampworks "Volt" Ltd.,

Tilburg, Holland.

It was FURTHER ORDERED that the Defendants deliver up to the OSRAM LAMP WORKS, LTD., or destroy in the Presence of their representatives, all such infringing lamps in their Possession, and that an inquiry be held to ascertain what damages had been sustained by such infringement, and that the Defendants Pay THE OSRAM LAMP WORKS, LTD., their full Costs, Charges, and Expenses in the Action as between Solicitor and Client.

**WARNING!** Dealers in and users of similar infringing lamps will be proceeded against.



### "ULTRALUX" GLASSWARE

THE Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), has recently placed on the market Ediswan "Ultralux," a new scientific glassware for electric light fittings. It is pure white, uniform in thickness, and embodies the latest ideas of scientific construction, coupled with an elegant appearance, so that it can be used



CONCENTRATING TYPE  
EDISWAN "ULTRALUX"  
GLASSWARE.

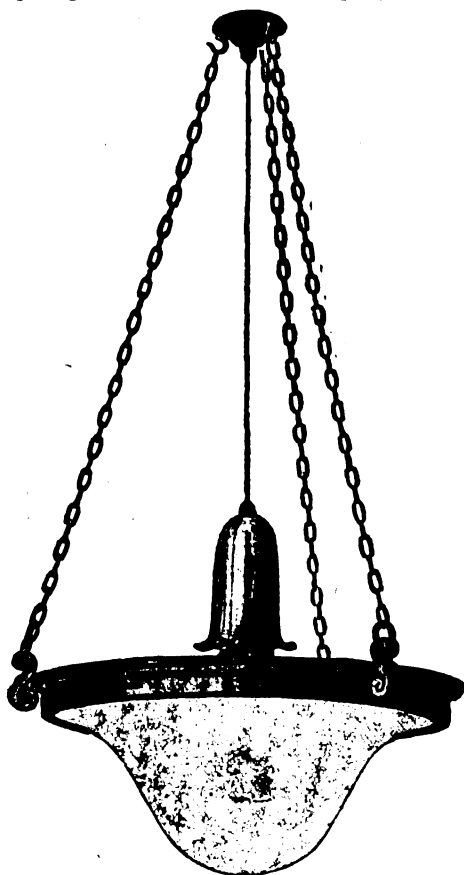


DISTRIBUTING TYPE  
EDISWAN "ULTRALUX"  
GLASSWARE.

for fancy or plain decorative work. A special feature is that a standard  $1\frac{1}{2}$ -in. hole is provided, so that galleries can be dispensed with. Ediswan "Ultralux" is made in two types, concentrating or intensive, as shown in the illustrations. A leaflet dealing exclusively with this glassware has been issued by the Company, and should be in the hands of every electrician interested.

### HALF-WATT LAMP FITTINGS

SEVERAL new fittings for Wotan half-watt lamps have been introduced by Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston). One of these, which is illustrated here, enables "Wotan" half-watt lamps to be adapted for indirect lighting, and in this case a deep opal bowl is used.



OPAL BOWL FITTING FOR  
HALF-WATT LAMPS.

The indirect lighting system has been to some extent handicapped owing to the loss of efficiency through the absorption of light by the reflecting surfaces. As half-watt lamps make it possible to double the candle-power of the lighting unit, indirect lighting schemes can be arranged at a reduced cost

and far more successfully than hitherto. This fitting can be arranged for 1,000- and 2,000-c.p. "Wotan" half-watt lamps in bowls 14 in. and 16 in. in diameter respectively.

Another fitting is made up for use with Holophane reflector bowls, and is especially suitable for the lighting of large halls, stores, and high-class business establishments.

A price-list will shortly be issued embodying these designs.

### A COMPREHENSIVE CATALOGUE

AN octavo bound catalogue of over 950 pages has been issued by the Electrical Co., 122-4 Charing Cross Road, W.C. Although this covers an immense range of electrical plant and apparatus, it does not pretend to be complete, and the Company say, in the preface, that to include all the goods they supply, a book nearly ten times the size would be required. Each section, however, is thoroughly representative of the class of articles that can be conveniently purchased without special quotations. The introduction gives some interesting views on the particulars of the works where the various products are manufactured, and gives a good idea of the magnitude of the Company's operations. The utility of the volume is also enhanced by the inclusion of the text of the Home Office factory and mining regulations, and a list of voltages of British supply undertakings. The successive portions of the catalogue deal with machines, control gear, high-tension and other switches, fuses and protective apparatus, and switchgear generally, installation material, fans, small motors and their applications, instruments, arc lamps, electric irons, and domestic and other heating and cooking apparatus, meters, electric clocks, cables, incandescent lamps, signs, and illuminating material. A great deal of useful information is included in every section, and the whole list is well arranged, well printed, and conveniently indexed.

### THE NEON LAMP

THE Neon lamp, as developed for advertising purposes, has just been put on the market in this country by the Westinghouse Cooper Hewitt Co., Ltd. (80 York Road, King's Cross, N.). A high-pressure alternating or pulsating current is necessary to work these lamps, but they are said to last about 1,200 hours, and are economical to run and simple to control. The Neon lamp consists of a lead glass tube with pure copper electrodes, sealed in by means of platinum, and evacuated by means of a mercury pump, and finally by means of charcoal cooled with liquid air. This also has the effect of removing impurities from the electrodes. Without this treatment the lamp is not successful. A trace of neon gas, the residue obtained by the fractional distillation of liquid air, is then introduced into the tube, and this sealed off. The light emitted contains no blue waves, but is a rich red, entirely different in colour from any other illuminant, and this is very attractive for signs. Existing signs may be illuminated by straight lengths of tube, or the sign wording may be traced by the tube itself. Straight tubes are usually 50 mm. (about 2 in.) in diameter and 6 metres (19.7 ft.) long, but shorter lengths can be supplied. The luminous intensity is said to be approximately 200 spherical c.p. per metre. The tubes for lettered signs are about 15 mm. (0.6 in.) diameter. As stated above, the lamp requires alternating or pulsating current. On A.C. circuits the pressure is stepped up by means of a small transformer, in the primary circuit of which is a regulating inductance and D.P. switches and fuses. For D.C. circuits a small motor-generator set, rotary-converter, or induction coil must be provided. In the case of the 50-mm. diameter tube 6 metres long, a current of 1 ampere passes, with a pressure of about 1,000 volts, across the electrodes. Each additional metre length requires about 100 volts extra. The lamps last about 1,200 hours without attention, but then require re-evacuating, as the neon appears to be absorbed by the electrodes and the glass. They light up as soon as the switch is closed. It is found that, by introducing a minute quantity of a mercury salt into a neon tube, an enhanced effect may be obtained, as the neon gas gets compressed into a band, which continually travels along the tube from end to end, and the characteristic colours of the neon and mercury vapour are produced in the same tube. These Neon lamps have been used in Paris for some little time, and one is now running outside the West End Cinema, Coventry Street, London. W.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Blackpool.**—An application is to be made for sanction to borrow £15,000 for cable extensions.

**Brighton.**—The Borough Electrical Engineer reports that the following loans will be necessary in order to meet future expenditure:—Distribution mains, £5,000; services, £4,250; motors for hire, £3,000; heating and cooking apparatus, £2,500.

**Cambridge.**—The University Buildings Syndicate is seeking authorisation to spend £3,000 upon a power station in the Engineering Laboratory.

**Colwyn Bay.**—A proposal to build a new generating station estimated to cost £21,000 is to come before the Council shortly.

**Heston and Isleworth.**—Twelve months' supply of cable, meters, &c. Borough Electrical Engineer. March 7th.

**Manchester.**—Tramway rail bonds, trolley-wire and span-wire brackets. General Manager. March 17th.

**New Zealand.**—The Dunedin Corporation anticipates a considerable expenditure upon its electric supply undertaking.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bradford.**—New infirmary (£200,000).

**Cleethorpes.**—New public hall adjoining Town Hall.

**Leicester.**—Extensions to sanatorium. Clerk, County Council, 10 New Street.

**London: L.C.C.**—Two hundred lights at Upper Marylebone Street School, Great Portland Street, W. (See an advertisement on another page.)

**Southampton.**—New library at Portswood.

**Wellingborough.**—Technical institute, Midland Road.

### Miscellaneous

**Blackpool.**—Six open-type bogie cars. General Manager. March 25th.

**Deane Valley.**—The Light Railway Commissioners have been holding an inquiry into the joint light railway scheme of the Urban District Councils of Wombwell, Wath-on-Deane, Bolton-on-Deane, and Thurnscoe. There is considerable opposition to it on the part of the railway companies and others. The proposed scheme has excited considerable interest in the district owing to the development of the South Yorkshire coalfield, and the difficulty which miners experience in getting to their work.

**Netherlands.**—The name and address of a company which proposes to build a factory for the manufacture of electric cables is on file at 73 Basinghall Street, E.C.

## TENDERS RECEIVED AND ACCEPTED

**Accrington.**—The following tenders have been accepted:—Two 1,000-h.p. gas engines, National Gas Engine Co., £10,750; alternator and dynamo, Bruce Peebles & Co., £2,550; gas-making plant, the Power Gas Corporation, £11,000; three single-deck tramcars, Brush Electrical Engineering Co., £2,832; double-deck tramcars, £2,092.

**Ipswich.**—An order has been placed with H. W. Butler & Co., Craven House, Kingsway, the London Agents of the A.C.E.N.E. Cable Works, Jeumont, France, for high- and low-tension cable extensions.

**London: L.C.C.**—Tenders were invited from forty-six firms manufacturing metal filament lamps other than drawn-wire filaments, and that of Pope's Electric Lamp Co. is recommended for acceptance under items 8 to 27 of Schedule No. 17. The lowest tender was for lamps of foreign make, which was not satisfactory, and the next lowest tender, that of the Electric Lamp Supply Co., was also for lamps of foreign

make. The lowest British tender was that of the Pope Co., whose prices are about 11 per cent. above those of the Electric Lamp Supply Co.'s tender.

## APPOINTMENTS AND PERSONAL NOTES

A switchboard attendant is required in the Stoke-on-Trent Electricity Department. (See advertisement on another page.)

Mr. H. Wood, of Doncaster, has been appointed Engineering Draughtsman in the Stoke-on-Trent Corporation Electrical Department, at a salary of £104, rising to £130 per annum.

The Colne Council will shortly be advertising for a Tramway Manager at a commencing salary of £225 per annum.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £66 10s. to £67. (Last week, £67 to £67 10s.)

**Bankruptcy.**—F. I. Behrens, trading as Fred Burns, Electrical Engineer, 16 Market Street, Barnsley, has been adjudicated bankrupt. A first meeting of creditors will be held at the County Court Hall, Regent Street, Barnsley, on March 9th, at 10.30 a.m., and the public examination at the same place on March 26th, at 10.30 a.m.

**Change of Address.**—R. Belfield, Ltd. (3 London Wall Buildings, London Wall, E.C.), inform us that they are moving into more suitable offices on March 16th, at 65 Victoria Street, S.W.

**Dissolution of Partnership.**—V. J. Harraway and A. J. Cunningham, carrying on business at 146 High Street, Kensington, and 45 King's Road, Chelsea, as Harraway Bros., Electrical Engineers, have dissolved partnership, on the formation of a limited company to carry on the business.

**New Branch.**—Galsworthy, Ltd. (15 and 16 Newman Street, W.), are opening a branch in Leeds, with showrooms, at Athenian Buildings, 9 Park Lane. Mr. W. B. Clifton will take over the management of the Leeds branch, and they have appointed Mr. Wm. A. Maddick to represent them in London and on the South Coast.

**Liquidations.**—The Electromotor Equipment Co., 59-65 Paul Street, London, is to be wound up voluntarily. The liquidator is Mr. O. Steiner, 21 Old Broad Street, E.C. A meeting of creditors will be held at the above address tomorrow, March 6th, at 2.30 p.m.

**New Telephone Number.**—The Record Electrical Co. (Caxton House, Westminster, S.W.) have now an additional telephone line, and their numbers are Victoria 6700 and 6701.

**Osram Lamp Patents.**—On Friday last Mr. Justice Eve had before him a summons by Osram Lamp Works, Ltd., against the Gabriel Lamp Co. for an injunction to restrain alleged infringement of Osram metal filament lamp patents. An order had been previously made for the Gabriel Lamp Co. to answer certain interrogatories, but they refused to answer two of these, which asked whether the lamps sold by the Gabriel Co. were supplied by the Campagne Générale d'Electricité of Paris. Mr. Justice Eve decided that the information desired was not a proper subject for interrogatories.

It is announced that Osram Lamp Works, Ltd., has obtained an injunction against the Electric Fittings Supply Co. for infringement of patents Nos. 23,899 of 1904 and 18,622 of 1906. The infringing metal filament lamps were "Volt" lamps, made by Metallic Glowlampworks "Volt," Ltd., of Tilburg, Holland.

## THE RECORD ELECTRICAL Co., Ltd.

LONDON OFFICE:  
CAXTON HOUSE,  
WESTMINSTER, S.W.

Telephone:  
Victoria 6700 6701  
Telegrams & Cablegrams  
"Infusion,"  
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**CIRCUIT  
BREAKERS.**

**RECORD'S PATENT.**

WORKS:  
BROADHEATH,  
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Telephone:  
164 Altrincham.

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Write for Prices & Particulars.

## LOCAL NOTES

**Bingley: Electricity Supply.**—The new sub-station, which is supplied by the Keighley Corporation, and from which electricity is distributed in detail by the Council, has now been put into operation. The total cost of the scheme has been about £7,000.

**Edinburgh: Street Lighting.**—Notice of motion has been given by Bailie Stevenson, the Convener of the Electric Lighting Committee, recommending that the Cleaning and Lighting Committee should report as to the lighting of the whole of the streets in the City with electricity.

**Elgin: Electric Lighting.**—The question of introducing electric supply in the district has been referred to the Council in committee.

**Japan.**—A company is said to be in course of formation at Fukushima for developing certain water powers with a capital of about £51,000. The name and address of the new company is on file at 73 Basinghall Street, E.C.

**Limerick: Electric Lighting Undertaking.**—For the first time for several years the accounts of the electricity undertaking show a profit. The loss per annum has hitherto averaged £1,600.

**Manchester: Electricity and Gas Management.**—In his address to the Manchester District Institution of Gas Engineers last week, Mr. J. G. Newbigging, Chief Engineer to the Manchester Corporation Gas Department, advocated the single management of municipal electricity and gas undertakings as being in the best interests of the ratepayers. This matter, of course, has some reference to the feeling which exists in some parts of the country that electricity and gas undertakings should not compete in the matters of price.

**Southport: Electricity Tariffs.**—There has been considerable controversy recently as to a rearrangement of the Electricity Department's tariffs, but an endeavour by the Committee to frame a tariff which would help to develop the use of electricity in small houses has been defeated after a two hours' debate at a special meeting of the Corporation. The proposed charge for cottage property was 7s. 6d. per lamp for installation, with a minimum of three lamps, and 1½d. per lamp per week for current if paid a month in advance, and 2d. per week if paid a week in advance. All lamp renewals to be paid for by the consumer. For larger houses the charge proposed was 10s. per lamp for installation, with a standing charge of £2 10s. to £11 10s., according to the size of the house, plus ½d. per unit for all current used.

**Stoke-on-Trent: Street Lighting.**—An experiment is being made in Liverpool Road with some 600-c.p. half-watt lamps.

**Torpoint: Electric Lighting.**—A poll of ratepayers has been taken as to the method of lighting for the next five years. Out of 1,150 electors, only 425 voted, and the result shows a majority of 55 for electricity.

## NEW COMPANIES

**MIDLAND ELECTRIC ROTARY BLOWING CO.,** Traffic Street, Derby. Capital, £1,000. Electric organ-blower makers. **LIGHTING SUPPLIES,** 36 Commercial Road, E. Capital £2,000. Chairman, H. A. Jacoby.

**Lantern Slides.**—In view of the large number of demands made for sets of lantern slides to illustrate lectures on electrical subjects, the General Electric Co. have prepared a series of slides which represent the latest practice in electrical work, and which it is believed will prove a source of considerable interest to scientific and engineering societies. In order to add to the interests of the slides, a description of each has been prepared, and accompanies the slides, which the General Electric Co. will loan with pleasure to any responsible engineer. Application should be made to the Advertising Dept., 67 Queen Victoria Street, London, E.C.

**Henley's Cables.**—W. T. Henley's Telegraph Works, Co., Ltd., send us a folder, intimating that purchasers of their "Association" and "Non-Association" cables and wire can distinguish these products by stripping the tape round the core. The firm's name and an indication of the class of cable appears in every case on the back of the tape.

**"Mazda House News."**—The current number of the bright journal conducted by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), is a special half-watt lamp issue, and a great deal of information regarding the Mazda half-watt lamp is given. Numerous designs of fittings for use with these lamps are illustrated.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**Bastian Meter Co.**—There was a slight decrease in the net trading profits last year compared with the previous twelve months. A 2½ per cent. dividend is recommended on the ordinary shares.

**Hove Electric Lighting Co.**—The annual report states that the Hove Corporation has notified the Company that the agreed purchase price of the undertaking, viz., £175,500, will be paid in three or four weeks' time. The result of the past year's working shows a reduction in net revenue of £601, but a dividend, making a total of 9 per cent. for the year, is declared on the ordinary shares, leaving a surplus of £8,365.

**Fife Tramway, Light & Power Co.**—It is proposed to increase the company's capital by an additional 50,000 preference shares and a similar number of ordinary shares. The company's business has considerably increased during the past twelve months, and a dividend of 3½ per cent. is declared upon the ordinary shares.

**North-East Coast Power Companies.**—A scheme has been devised for a closer union of the interests of the County of Durham Electrical Power Distribution Co. and the Newcastle Electric Supply Co. The arrangement is that the latter Company should acquire the outstanding shares in the Durham Company.

**Premier Electric Control.**—The capital has been reduced, by order of the High Courts, from £10,000 to £4,125.

**Waste Heat and Gas Electrical Generating Stations.**—The report and accounts given in our last issue were adopted at the meeting on Friday. The Chairman mentioned that proposals are now under consideration for the erection of one or two more generating stations, and it is hoped to get the works well in hand during the current year.

**Accounts of London Supply Companies.**—With few exceptions, all the London electric supply companies have now issued their accounts for 1913, and not the least interesting feature of them is the large amounts which stand to the credit of reserve funds. For instance, the City of London Co. is proposing to carry forward £27,836, making the reserves total £240,251. A final dividend making 10 per cent. per annum on the ordinary shares is recommended against 9 per cent. for the previous twelve months. In the case of the Metropolitan Electric Supply Co. there is a sum of £319,355 standing to the credit of depreciation and reserve fund, including £22,000 set aside from the past year's accounts. A final dividend, making 4½ per cent. for the year compared with 4 per cent. in the previous year, is recommended. The Chelsea Electricity Supply Co. recommends a final dividend, making 5 per cent. for the year, the same as in 1912. The Charing Cross Company's dividend is 6 per cent. compared with 5 per cent., the Notting Hill Co. 5s. per share, as in 1912, and the South Metropolitan Electric Light and Power Co., while not declaring a dividend on the ordinary shares owing to the provisions of a debenture trust deed, has transferred £10,000 to reserve, and £5,000 to depreciation account. The County of London Co. makes a 7 per cent. distribution for the year, compared with 6 per cent. last year, at the same time carrying £33,000 to reserve, depreciation, and renewals. The Brompton & Kensington Co. recommends a final dividend, making 10 per cent. for the year.

**North Metropolitan Power Supply Co.**—The proposal to raise £100,000 new preference stock has been sanctioned by the shareholders.

**British Insulated & Helsby Cables.**—A 13 per cent. dividend is recommended upon the ordinary shares, compared with 10 per cent. in 1912.

## What the Public Wants

Booklets describing in simple language the various applications of electricity.

Part I. "Electric Lighting" (Price 1d., by post 2d.).

Part II. "Electric Cooking and Heating, and other Domestic Uses of Electricity" (Price 2d., by post 3d.).

Part III. "Works Driving" (Price 2d., by post 3d.).

Prices for quantities on application to the  
**KILOWATT PUBLISHING CO., LTD.,**  
TEMPLE CHAMBERS, LONDON, E.C.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 376 [VOL. X., No. 11]

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THURSDAY, MARCH 12, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

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OFFICIAL NOTICES and TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL and PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5309 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

A NEW set of working rules for the London District has been issued by the London Electrical Masters' Association. An increase of wages from 9d. to 10d. per hour is granted from April 1st, with a further increase to 10½d. from July, but for "pipe-fitters" the wages are to remain at 9d. Whether the Electrical Trades Union, which demanded a minimum of 11d. and no grading of workmen, will take any action in the matter, will probably be decided at a meeting to-night. (Page 142.)

THE principal features of the Lloyd electric vehicles for commercial purposes are described in an illustrated article which contains particulars of a 5-cwt. lorry, a 2½-ton chassis, and a tractor for drawing 3 tons, all driven by motors geared to the front wheels. (Page 143.)

THE British Thomson-Houston Co. is bringing actions for infringement of its drawn tungsten filament patent No. 21,513/06 against several firms. We give the claims in the patent specification in question.—The Law Officer, on appeal, has allowed the grant of patent No. 5,026/12, in spite of the opposition, but he has upheld the Comptroller's decision not to grant on applications 5,027/12 and 5,028/12. These patents were applied for by J. Hubers on behalf of Julius Pintsch A.-G. (Page 144.)

THE report of Mr. A. P. Trotter's recent Paper on medium- and low-pressure overhead line construction is concluded. A simple triangular guard, which may be applied to the lines in various ways, has been sug-

gested by the cradle used by the Clyde Valley Electrical Power Co. The latest B.O.T. regulations for low-pressure overhead lines provide that the earth wire forming the neutral of the three-wire system, or the fourth wire of a three-phase four-wire may be used as a guard wire. Two guard wires are necessary, but they need not both be neutral conductors. (Page 145.)

A PAPER by Mr. W. G. Stokes, read at a meeting of the Manchester Branch of the Association of Electrical Station Engineers, dealt with the electrical driving of cotton mills. (Page 146.)

THE Electric Vehicle Committee of the I.M.E.A. have agreed upon the standardisation of a charging plug. (Page 146.)

At the annual meeting of the Metropolitan Electric Supply Co. on Tuesday, the Chairman referred to the London Electric Supply Bill as an attempt to "jockey" the companies, but he thought that the measure would in all probability be dropped owing to the opposition to it. (Page 146.)

THE rating of pipe-ventilated motors is discussed in our Questions and Answers columns. (Page 147.)

A SCHEME of multiple-unit train control on the Ward-Leonard system, which has showed a 20 per cent. energy consumption over the ordinary methods of control during trials on the Metropolitan Railway of Paris, is described.—The Liverpool Corporation Tramways are contributing £100,000 in aid of the rates.—The Bill for the proposed tube railway under the Tyne has been dropped. (Page 148.)

WE regret to have to announce the death of Mr. John Gott, Consulting Electrician to the Commercial Cable Co.—The reorganisation scheme of the British wireless coast stations is fairly well advanced.—The Committee for Radiotelegraphic Investigation of the British Association asks experimenters to determine if any variations in the strength of wireless signals is noticed during the coming total eclipse of the sun. (Page 148.)

PARTICULARS relating to a number of patent opposition cases, amendments, &c., are given in our "Patent Record." A Patent by A. Wright and Reason Manufacturing Co., dealing with electrolytic mercury ampere-hour meters, expires during the week after a full life. Among the specifications published by the Patent Office last Thursday is one by A. Williams relating to submarine telephony, &c., one by G. Marconi for an arrangement whereby high-frequency currents suitable for wireless are produced, and one by B. Ljungström and A. D. Widström for improving commutation. (Page 150.)

A NEW pattern of holder for half-watt lamps and a recent design of electric drill are illustrated in our Trade Section, which also contains an article on thermal circuit-breakers. (Pages 151 and 152.)

NEW plant is required at Derby (£12,540), Walsall (£5,184), Malvern, Colechester, Swindon, Carlisle, Hali-



fax (£7,000), Torquay (£5,000), Dartford.—Miscellaneous stores are required at Dundee and by the War Office; and street electric lighting schemes are under consideration at Clacton and Monmouth. (Page 153.)

THE Swansea Electricity Committee has decided against allocating electricity profits to relief of rates.—Difficulties with regard to condensing water are being encountered in connection with the proposed new power house at Manchester.—A scheme for supplying in bulk to Malvern by the Worcester Corporation is under consideration.—The Brentford Gas Co. is applying to Parliament for electric lighting powers, and also to supply power gas, and is meeting with much opposition from the electricity supply undertakings in its area. (Page 154.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, MARCH 12TH.

*Institution of Electrical Engineers.*

8 p.m. "The Design of Rolling Stock for Electric Railways," by H. E. O'Brien.

SATURDAY, MARCH 14TH.

*Royal Institution.*

3 p.m. Afternoon lecture III.—"Recent Discoveries in Physical Science," by Prof. Sir J. J. Thomson, F.R.S. *Birmingham and District Electric Club.*

7 p.m. At Swan Hotel. "Electric Driving of Mills," by W. Y. Anderson.

MONDAY, MARCH 16TH.

*Institution of Electrical Engineers: Western Section.*

5.30 p.m. At University, Bristol. "The Construction of a Wireless Station," by C. G. Roach.

*Institution of Electrical Engineers: Newcastle Section.*

7.30 p.m. At Armstrong College. Exhibition of Measuring instruments.

TUESDAY, MARCH 17TH.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Municipal School of Technology. "Diseases of Static Transformers," by J. L. Thompson.

*Illuminating Engineering Society.*

8 p.m. At Royal Society of Arts. "A Comparison between Illumination Estimates and Performance in Practice," by W. C. Clinton.

*Institution of Civil Engineers.*

8 p.m. Papers to be further discussed:—"Rail Steels for Electric Railways," by W. Willox, and "Rail Corrugation and its Causes," by S. Sellon. Paper to be read:—"Comparative Economics of Tramways and Railless Electric Traction," by T. G. Gribble.

WEDNESDAY, MARCH 18TH.

*Electrical Trades Benevolent Institution.*

2.30 p.m. Annual General Meeting at Institution of Electrical Engineers.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. At Victoria Embankment. "Electricity in Docks and Harbours," by J. M. Heslop.

## The London Electrical Engineers.

46 Regency Street, S.W.

*Rating Exam.* for all Cos. from 7 to 10 p.m. every Wednesday. *Headquarters* open from 10 a.m. till noon every Saturday.

(TO-DAY) THURSDAY, MARCH 12TH, C. Co. FRIDAY, MARCH 13TH, D. Co. MONDAY, MARCH 16TH, A. Co. TUESDAY, MARCH 17TH, B. Co., Tech. Inst., 7 to 10 p.m. Min. Range Practice, 7 to 9 p.m.

## THREATENED WIREMEN'S STRIKE

THE following is the full text of the new working rules and conditions of employment for the London District which have just been issued by the London Electrical Masters' Association.

*Area.*—The area under which these rules shall apply is to be taken as within a radius of 12 miles from Charing Cross.

*Scope of Rules.*—These rules are not intended to apply to work on the Undertakers side of a Supply Authorities' terminals, or to employees who may be engaged for full time in a factory on manufacturing work.

### RULES.

1. *General.*—No exception shall be taken to the employment or non-employment of any workman in the electrical trade on the ground that he is or is not a member of any organised Trade Society, neither shall any exception be taken to the employment of a workman in any other trade on the ground that he is or is not a member of a Trade Society.

2. *Working Hours.*—The recognised working hours shall not exceed 53 per week.

3. *Night Shift.*—Workmen engaged on a "night shift" shall be paid one penny per hour in addition to the ordinary rate of wages, provided that workmen on a night gang shall not have been employed during the preceding day. The hours worked without overtime rates not to exceed ten per day of twenty-four hours. Double time to be paid for all time worked between Saturday midnight and Sunday midnight.

4. *Overtime.*—Overtime to commence after a day's work of ten consecutive hours (meal times excepted), and to be paid at the following rates:—Up to 8 p.m., time and a quarter; from 8 p.m. to 10 p.m., time and a half; from 10 p.m. to starting next day, double time. *Saturdays.*—From 1 p.m. to 4 p.m., time and a half; after 4 p.m., double time. *Christmas Day and Sundays,* double time. Each day to stand by itself. If the work continues after 1 a.m., and there is no ordinary means of conveyance home available, workmen shall be paid at overtime rates up to 6 o'clock next morning, unless some means of conveyance to their homes is provided by the employer.

5. *Wages.*—The following are the recognised rates of wages, and shall be observed as such:—Wiremen, on and after the first pay day in April, 1914, 10d.; do. July, 1914, 10½d. Pipe Fitter only, on and after the first pay day in April, 1914, 9d. No Pipe Fitter shall be engaged on wiring. Should wiremen be employed on pipe-fitting, their rates shall be maintained as wiremen. Improvers: After having been indentured or engaged for three years, to be paid at not less than the following rates:—Up to the end of the 4th year, 4d. per hour; 5th year, 5d.; 6th year, 6d.; 7th year, 7d. Apprentices subject to agreement with employer. At least half the hands engaged on the actual erection of electric wires, tubes, casings, or fittings shall be wiremen or pipe-fitters, or in receipt of equal rates of pay.

6. *Notice of Determining an Engagement.*—One hour's notice to be given on either side.

7. *Payment of Wages.*—Wages shall be paid on the job, but if otherwise arranged, travelling time and expenses shall be allowed to get to the pay-table.

8. *Travelling Expenses.*—Workmen who are sent from the shop to a job to any point more than two miles from the shop within the London District, shall be allowed workmen's fares daily, but no travelling time, from the shop to the job, but this rule shall not apply to men taken on at the job.

9. *Country Expenses.*—Where men are sent outside the area covered by these rules, they shall be paid at the rate of 1s. 6d. per night, but when away for less than seven days at the rate of 2s. per night, together with fares out at the commencement of the job, and home on completion. Travelling time at ordinary rates. Such men to have the option, where circumstances permit, of working two hours per day extra without overtime at ordinary rates.

10. *Wireman.*—A fully qualified wireman must be over 21 years of age, and have served an apprenticeship or have been engaged in the trade for a period of not less than seven years.

11. *Improvers or Assistant Wiremen.*—Shall either have been indentured for a term of not less than three years, or have been continuously engaged by a responsible firm or firms for a similar period in learning the trade of wireman, but have not the qualifications mentioned in the definition of a wireman.

12. *Apprentices.*—All apprentices shall be properly indentured for a term of not less than three years.

As is seen from the above, the London Wiring Contractors have decided on the conditions and rates of pay they are willing to grant, and they will come into force almost at once. There will be a meeting of the Electrical Trades Union to-night to consider these rules, and we are informed that a ballot will be taken. Objection "on principle" is taken by the Union leaders to the first rule. The London District Secretary of the Union also objects to classification of pipe-fitters, holding that the running of conduits and casings is the work of a wireman, and should be paid for at full rate. He also informs us that he considers the rule relating to improvers "is not satisfactory in all its bearings."

There can be no doubt that the above rules may be taken as the carefully considered decision of a body representing a very large proportion of the wiring contractors in London, and representing, in fact, practically all the contractors who employ Trade Union workmen; they grant a good increase of pay to wiremen, viz., a rise next month from a minimum of 9d. an hour to a minimum of 10d., and a further increase in July to 10½d. The men would certainly be ill-advised if they vote for a strike, for the employers have made a good offer, and evidently intend to stand firm; the wages and conditions of employment are so good that, even if a strike were declared by the Union, there would be many workmen, Union as well as non-Union, who would refuse to throw up their jobs.

The Committee of the Masters' Association, we understand, will consider a proposal that they should meet a deputation from the Electrical Trades Union with regard to the rules, and if this is decided upon the meeting will probably take place on Thursday next.

## LLOYD ELECTRIC COMMERCIAL VEHICLES

THE Lloyd electric vehicle is the result of considerable experience on the Continent, where, until lately, there has been a readier market for battery-driven cars than in this country; but with the attention that is now being given to the subject here the conditions are becoming much more favourable to their adoption, and the opportunity is being taken by Messrs. Mossay & Co., Ltd., to commence a career for this vehicle in England. Through the kindness of the directors of this firm, we were able recently to inspect some examples of commercial types of Lloyd electric automobiles at their premises at 45 Horseferry Road, Westminster. The principal feature of the system employed is the use of separate motors, one to drive each of the front wheels through single reduction gearing, arranged so that the whole unit of wheel, motor, and gear turns on the steering

The motors are four-pole, fully-enclosed machines, with two poles wound and two consequent poles. They are without interpoles, and are compound-wound in nearly all except the smallest sizes, such as the 5-cwt. lorry already mentioned. Each drives through a 10 to 1 gear consisting of a helical pinion and internal gear ring. Waterproof glands are provided where the cables enter the motor case, and the end covers are easily removable for access to the brushes. Ball bearings are used throughout. It is important to notice that the steering pivots are in line with the points of contact between the wheel and the road, which greatly reduces transmission of shocks to the steering wheel. Indeed, at the comparatively low speeds for which these vehicles are designed, the presence of the motor which has to be turned with the wheel to steer is scarcely felt, and the steering is very easy.

The main controller is of the plain drum type, and is contained usually in the steering column; it is seen with

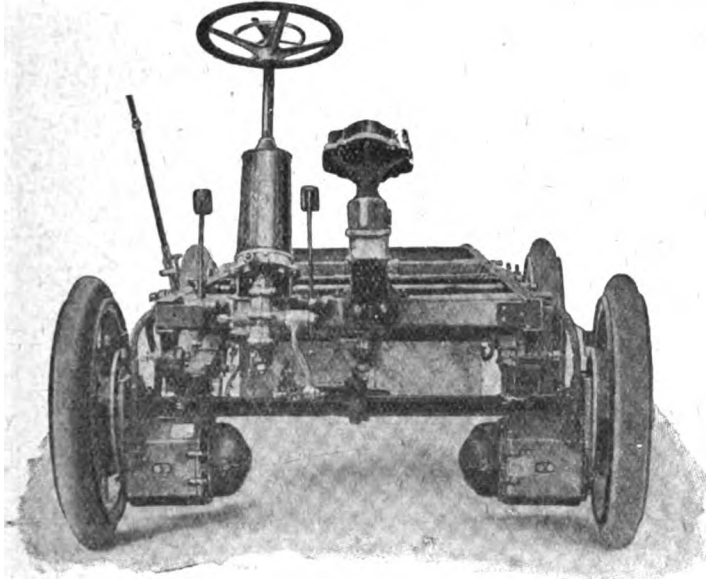


FIG. 1.—FRONT VIEW OF 2½-TON CHASSIS.

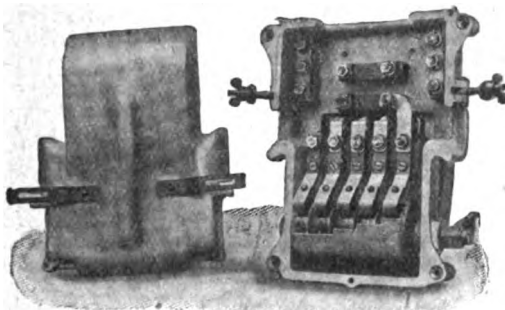


FIG. 2.—PEDAL CONTROLLER WITH COVER REMOVED.

pivots. By this means it is claimed that a lighter and more efficient motor can be used than is possible with a gearless hub motor, while the advantages of front-wheel drive can be retained without rendering the steering at all difficult. There are also special features in the control gear, and, as regards the battery, it may be said at once that the well-known Tudor cell is employed exclusively.

The first vehicle that we inspected was a neat little 5-cwt. lorry, which was just ready for delivery to the Bootle Corporation. In this, the battery, of 40 cells rated at 182 ampere-hours, is slung under the centre of the chassis, while the small bonnet in front contains the controller and all connections, arranged to be easily accessible. This little car has a slightly smaller battery than the standard size, but with the standard 160 ampere-hour battery a mileage of fifty should be obtained on one charge, with a consumption of about 2.75 miles per kw.-hour charge. The motors are rated at 1 h.p. continuously with overload capacity up to 2½ h.p. each. The general features of the motors and control are similar to those of the large chassis described in more detail below.

A front view of another chassis which we saw, to carry loads of about 2½ tons, is illustrated in Fig. 1, from which the position of the motors geared to the front wheels is seen.

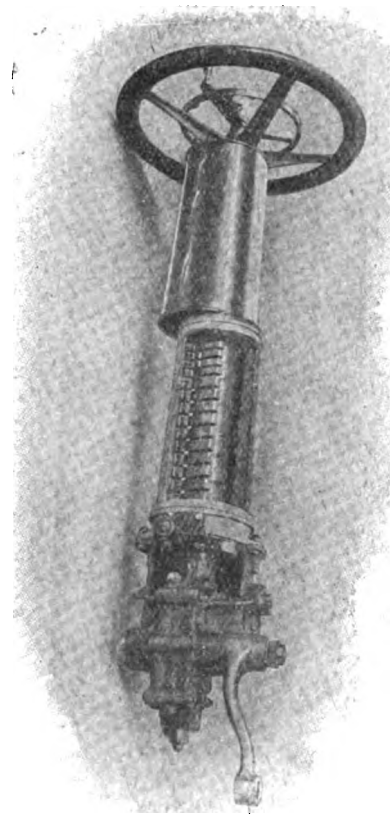


FIG. 3.—STEERING PILLAR AND MAIN CONTROLLER, WITH COVER RAISED.

the cover removed in Fig. 8. This is not employed to make or break the circuit, but only to vary the motor connections. It corresponds exactly to the change-speed lever of a petrol car, and there is a second controller which completes or breaks the circuit and controls the cutting out of the resistances. This is used for starting and manoeuvring in almost the same way as a clutch pedal. In its extreme forward position the circuit is broken, and as it is allowed to come back the resistances are gradually cut out. The separation of these parts of the controller has the advantage of giving a control system easily learnt by petrol drivers, and makes a sharp distinction between running and resistance steps, as resistance can only remain in circuit when the foot is bearing on the pedal. Again, all circuit-breaking is done on the small controller, the drum of which is cheap to renew. A view of the pedal controller is seen in Fig. 2. Five forward speeds, one reverse, and one braking position are provided for. The battery is arranged in two sections, which are put in series or parallel as required, and the motor armatures are kept always in series. The series field windings are also kept in series with each other, and the shunt windings are in two groups. For the first three forward speeds the two halves of the battery are in parallel. On the first speed the armatures are

in series with the series fields, and the shunt fields are excited by the battery in two groups in parallel; for the second speed the shunt windings are cut right out, and for the third speed the shunt fields are again connected as in the first speed, but the series windings are short-circuited. This notch, which corresponds to a plain shunt characteristic, can be used for regenerative braking from speeds higher than that at which it will drive. For the fourth speed the halves of the battery are in series, and one section of the shunt windings is excited off each half of the battery, thus placing them virtually in series. For the fifth speed the battery, armatures, and series windings all remain in series, while the shunt windings are disconnected. The main braking position puts the field windings one on to each half of the battery, disconnects the series windings, and short-circuits the armatures. The reverse corresponds to the first position with the armatures reversed. All the connections are well protected with drip-proof covers under the floor-boards, where the main fuses, ammeter shunt, &c., are also placed. A standard connection bolt is used, requiring one spanner, and all connections are copper on copper. A plug is provided by the withdrawal of which the driver can prevent the circuit being made in his absence, and a combined voltmeter and ammeter is mounted in a convenient position. In addition to the electric brake acting on the front wheels, there are internal and external mechanical brakes on the rear wheels.

The battery in the 2½-ton chassis is mounted under the centre of the vehicle, and is lifted and lowered by a special hoisting gear on the chassis, but the weight is taken normally by hooks. In the smaller vehicles, the hoisting gear takes the form of jacks on the battery trolley. The 2½-ton chassis has an available platform length of 11 ft. 5 in., and weighs

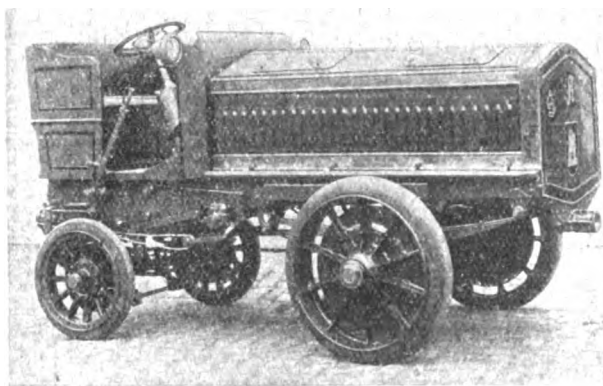


FIG. 4.—TRACTOR FOR A LOAD OF 8 TONS.

without battery 1 ton 5 cwt. The battery of forty cells, of a capacity of 280 ampere-hours, weighs 17 cwt., and is designed to propel the vehicle forty miles on one charge, with a consumption of 1.25 miles per kw.-hour charge. The motors are rated at 2.6 h.p. with overloads up to 6 h.p. From our trial run on one of these chassis we can say that the running is remarkably smooth and quiet, the control excellent, and the vehicle quick in getting away without undue current consumption. Intermediate sizes, for loads of 1 and 1½ ton, are also made, and have the same general features. It may be noted here that the Tudor Accumulator Co. are prepared to enter into very favourable maintenance contracts, varying according to the nature of the work to be done by the car, but in the neighbourhood of 1½d. per car mile run.

Another interesting vehicle which we saw, of a type new to this country, was a battery-driven tractor for drawing a load of 8 tons. Exactly the same general system is employed. The motors, in this case series-wound, are geared to the front wheels in the way already described, but the battery is contained in a large bonnet above the front axle. This, together with the fact that the back part consists of little more than the driver's seat, gives the vehicle the appearance of a somewhat mis-shapen racing car. The battery weighs about a ton and a quarter, and the whole tractor about 4 tons. The control is similar to that employed in the other Lloyd vehicles, but as the motors are only series-wound there is no provision for electric braking. The same standard controller parts are used, but to deal with the heavier current the contacts on the pedal controller are duplicated. In addition to powerful mechanical brakes on the tractor, provision is made for actuating brakes on the vehicles towed by a wire rope, and a compensating arrangement is used to allow for the effect of the play of the spring

draw hook. Without load the tractor can travel at thirteen miles an hour, and with its full load can maintain at least eight miles an hour on the level. In another form of tractor the back part can be attached rigidly to the vehicle to be towed, and the back axle of the tractor is raised from the road so that for steering purposes one vehicle only is formed. This form is a little lighter than the tractor which we saw. One of these tractors is illustrated in Fig. 4.

Another special Lloyd vehicle is a complete electrically-driven street-washing machine, with water-tank and revolving brush, which is already largely used on the Continent where, with all due deference to our local authorities, street-cleaning has reached a higher pitch of perfection. Lloyd electric vans are largely used by the Post Offices of Germany, Denmark, and Sweden, and a Continental cab company has used electric cabs of this make for seven years. In several German towns trucks drawn by Lloyd electric tractors are used to serve dust-destructors, and for various other municipal services these vehicles are in extensive use.

### DRAWN TUNGSTEN FILAMENT PATENTS

THE British Thomson-Houston Co., Ltd., as announced in our advertisement pages last week, has started actions against the following firms for injunctions to restrain the manufacture or sale of tungsten wire or lamps in alleged infringement of patent No. 21,513\*/06. The firms against which the actions have been commenced are: Duram, Ltd., Preston Engineering Co., Ltd., Yorkshire Incandescent Lamp Co., Ltd., West Yorkshire Electric Co., Corona Lamp Works, Ltd. (Corona lamps), The Electrical Trading Co. (R.C. lamps), United Electric Supply Corporation (B.M.F. lamps), Wolfram Laboratorium, Dr. Ing. Paul Schwarzkopf G.m.b.H., B. B. Fenn (Fenn lamps), Rose Bros., Lacey & Co., and A. C. Cossor, Ltd.

Patent No. 21,513/06 was granted to the B.T.-H. Co., to whom it was communicated by the G.E. Co. of America. It was amended on the application of the B.T.-H. Co. last year (ELECTRICAL ENGINEERING, September 12th, 1912, p. 510; December 19th, 1912, p. 703; and February 27th, 1913, p. 122). The claims now read:—

(1) The method of working tungsten, which consists in subjecting the metal in a coherent form to the action of heat while it is being operated on or manipulated. (2) The method of working tungsten which consists in heating the metal by means of an electric current while it is being operated on or manipulated. (3) In a method of working tungsten as claimed in the preceding claims, protecting the coherent metal against oxidation during the working operation by means of a coating of metal which may be subsequently removed, or by conducting the operation in a vacuum or a reducing, or inert, atmosphere. (4) Incandescent electric lamp filaments of tungsten manufactured by working the coherent metal, substantially as hereinbefore described.

The appeal by the owners of Patents Nos. 5,026/12, 5,027/12, and 5,028/12 to the Law Officer has resulted in the Comptroller's decision to refuse the grant being reversed in respect of No. 5,026/12, but upheld in respect of the other two. The opposition to the grant was made by the B.T.-H. Co. The patents were in the name of J. Hubers, on behalf of Julius Pintsch, Akt.-Ges. Patent No. 5,026/12 may be briefly summarised as describing a process in which a compound of tungsten is mixed with between 1 per cent. and 5 per cent. of an oxide, or an equivalent proportion of a compound of thorium, or other rare earth metal, an alkaline earth metal or magnesium or zirconium, or a mixture. The mass is squirted and reduced in hydrogen, so as to avoid the formation of crystalline particles. The metals are finally alloyed together. Alternatively, colloidal tungsten may be used. The case has been dealt with in ELECTRICAL ENGINEERING for June 26th, 1913, p. 386; August 21st, 1913, p. 481; and January 8th, 1914, p. 20.

**The Electrical Trades Benevolent Institution.**—The annual general meeting will be held at the Institution of Electrical Engineers, Victoria Embankment, W.C., on Wednesday, March 18th, at 2.30 p.m. Mr. A. Bruce Anderson (Vice-President) will be in the chair. The business includes election of members of the committee of management, from which the following retire by rotation, but are eligible for re-election: W. B. Esson, E. Garcke, T. E. Gatehouse, C. E. Hunter, C. Koettgen, W. Schmahl, A. A. Campbell Swinton, L. Thurnauer, and R. J. Wallis-Jones. As already announced, the annual Festival Dinner will be held at the Trocadero on March 25th at 7.30. Mr. Hugo Hirst will preside.

## OVERHEAD LINE CONSTRUCTION FOR MEDIUM AND LOW PRESSURES

WE conclude the important Paper on overhead line construction for medium and low pressures which Mr. A. P. Trotter read at the meeting of the Post Office Electrical Engineers on Tuesday, January 20th. The first part of the Paper was given in *ELECTRICAL ENGINEERING* for January 22nd.

Fig. 8 shows a construction for three-phase four-wire work, and Fig. 9 is a design which saves the use of a second arm

so that the use of larger currents need not yet be provided for.

The latest code of Board of Trade overhead wire regulations for medium and low pressures fixes the minimum size of wires at No. 11½ S.W.G., or 200 lb. per mile of copper wire. This is for mechanical purposes, and is about the same gauge as the German minimum. With these conditions the new proposals are that an earthed wire forming the neutral or intermediate conductor of a three-wire system, or the fourth wire of a three-phase four-wire system, may be used as a guard wire. This has been recognised by the introduction

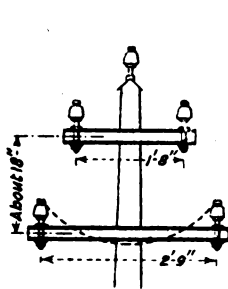


FIG. 8.—A THREE-PHASE FOUR-WIRE DESIGN.

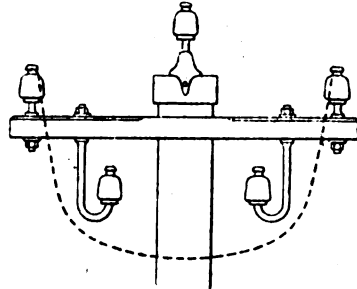


FIG. 9.—THREE-PHASE FOUR-WIRE DESIGN ADOPTED BY THE CLYDE VALLEY POWER CO.

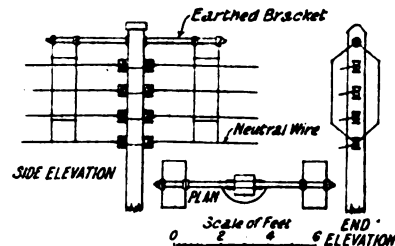


FIG. 10.—CRADLE USED BY THE CLYDE VALLEY POWER CO.

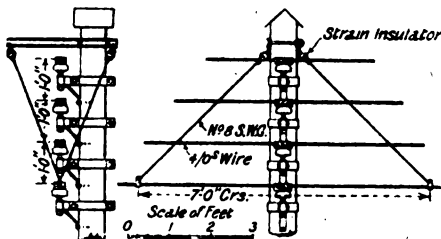


FIG. 11.—MR. E. M. HOLLINGSWORTH'S TRIANGLE GUARDING AT ST. HELENS.

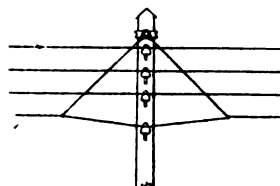


FIG. 12.—PROPOSAL FOR TIGHTENING TRIANGLE GUARDS.

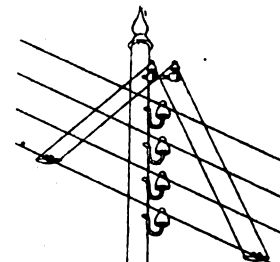


FIG. 13.—PARALLEL GUARDS.

and gives a deep pocket. Guard wires for telegraph and telephone lines are not provided in these and the following cases, as public safety against broken wires is the object. In using the arrangement shown in Fig. 9 at an angle pole, care must be taken that the "J" spindle shall pull away from the wires; if it faces the side pull it may twist round. This design is being adopted by Messrs. Strain and Robertson for the Clyde Valley Electrical Power Co. The triangular arrangement of the phase wires was thought to be necessary for electrical balance, but this does not affect the lines under consideration. Some engineers prefer to place the wires in a vertical plane even if a neutral and a switch wire for street lighting make a total of five wires. This avoids the use of arms, and enables service wires to be led off neatly from the mains. The methods shown in Figs. 9 and 10 cannot be applied. A form of cradle (Fig. 10) used by the Clyde Valley Co. has suggested a modification which may be called a triangle guard. It may be applied to wires set in a vertical plane in several ways. These triangles are of the nature of the cross wires already described. Fig. 11 shows a three-phase four-wire line constructed by Mr. E. M. Hollingsworth at St. Helens. The fourth wire is run at the bottom. The triangle wires are insulated from the cross arm to carry out the regulation that a circuit shall be earthed at one point only. As there is no pull on the triangle wires it is rather difficult to make them straight and tidy. In order to tighten the triangle, the fourth wire might be held down as shown in Fig. 12. A modification of the triangle guard is shown in Fig. 13. A short bracket is used at the top, and a cross arm of equal length is fastened to the fourth wire. The guards become parallel, and the clearance is the same for each level. The guards would prevent the cross arms from twisting. This method has not yet been tried. A three-phase four-wire design by Messrs. Herbert Lewis and Fletcher, employing triangle guards and a split fourth wire acting as guard wires, is shown in Fig. 14. An arm parallel with the line is used to hold out the ends of the triangle wires. This is being used in South Wales.

The foregoing designs indicate that some formal regulations for guard wires as distinguished from tramway guard wires are now necessary. It is not usual for the pressure to earth to exceed 250 volts, nor for the current in street-lighting circuits to exceed 20 amperes at the present time,

of the words "which is not connected with earth" in B.O.T. Regulation (No. 9):—

Where an overhead line crosses, or is in proximity to, any other wire or metal, precautions shall be taken by the Undertakers against contact between a conductor which is not con-

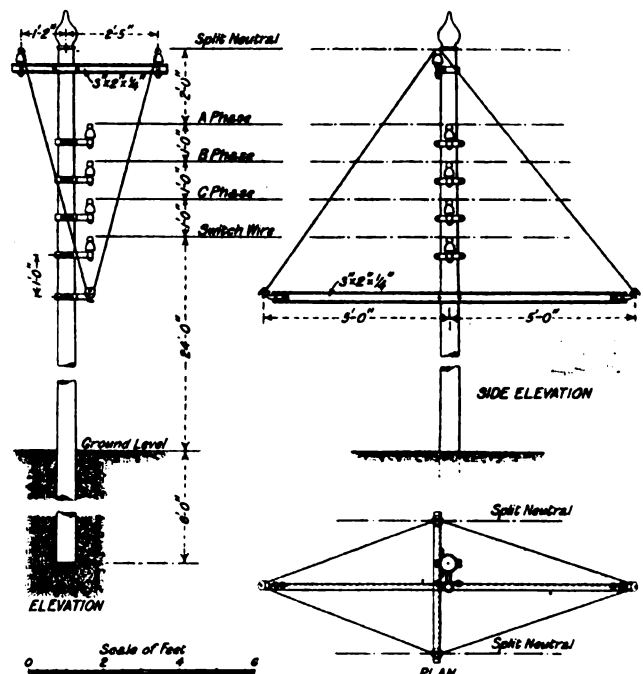


FIG. 14.—THREE-PHASE FOUR-WIRE DESIGN WITH GUARD WIRES USED BY HERBERT LEWIS AND FLETCHER.

nected with earth and any other wire or metal by breakage or otherwise.

The requirement that there shall be at least two guard wires has been a Post Office rule since 1905. But both wires



need not be neutral conductors. In Figs. 6 and 7 one of them is an earth wire. It has been suggested that one of the wires may be used as a switch wire for turning out part of the street lamps at a late hour. So long as the upper wires are not intended to serve as guard wires this is a convenient arrangement. While all the lamps are alight both the guard wires would be neutral wires connected with earth at the works or sub-station, but when part of the lamps are switched off by disconnecting the return wire with "earth" this wire becomes alive. The reduction of the vertical distance between the guard wires and the neutral wires to 8 in. instead of the 2 ft. required in tramway work, and an overlap of 4 in. instead of 8 in., are valuable concessions which are highly appreciated by those engineers who have heard of them. These dimensions are used in the designs shown in Figs. 6 and 7. In triangular guarding and in Fig. 9 the clearance between the guard wires and the lowest phase wire seems to be small, but it must be remembered that the guards are near the poles and the swing of a wire is very small there. In overhead construction engineers can use insulators reasonably proportioned to their requirements. The neutral wires being earthed at the works or at a sub-station will always be within a few volts of earth, depending on the drop along the route, and on any out-of-balance currents. The simplest shackle insulators should suffice.

### ELECTRICAL DRIVING OF COTTON MILLS

A PAPER on Electrical Driving as Applied to Cotton Spinning, by Mr. W. G. Stokes, was read on Thursday last at a meeting of the Manchester Branch of the Association of Electrical Station Engineers. In the mill with which the author was connected power was taken from the mains of the Manchester Corporation at 6,500 volts three-phase, and stepped down to 440 volts on the premises. The average H.T. current taken was 125 amperes at a power-factor of 0.8, representing about 1,500 h.p. Both squirrel-cage and wound rotors were used, all up to 45 h.p., with one exception, being squirrel-cage. The motors were slung from the ceiling, some in steel towers outside the building, and others in the rooms themselves. They ranged from  $1\frac{1}{2}$  to 150 h.p. Star-delta starters were used from 10 to 18 h.p., and compensators from 18 to 45 h.p. For the wound rotor motors, grid resistance starters were used. Ironclad oil-break switches with overload and no-voltage releases were provided for all motors, except those with star-delta starters, which had no-voltage releases and fuses enclosed in the starter. Push-buttons were provided about the rooms for stopping the motors in case of emergency.

The disadvantage of unreliability formerly urged against electric driving had long been overcome. The chief advantages of the electric drive were its steadiness, flexibility, the ease with which power records could be kept, and the short space of line in which all the machinery could be started or stopped. The conditions were best when power was taken from a large supply system, and the superior steadiness of turbine-driven generating plant was such that it should always be used in preference to slow-speed reciprocating engines, where private plant was decided upon. Among the disadvantages which might be brought against electric driving was the cost of the generating plant where no public supply was available, and the fact that some boilers had to be retained for heating purposes, even where outside supply was taken. There were also occasionally troubles due to unskilled operation of starting gear. "Taking everything into consideration," continued the author, "steam driving is preferable to a private plant with a slow-speed reciprocating engine; where a turbo-generator is used, the honours are slightly in favour of electricity but when the supply is taken from an outside source electrical driving is far and away the better method of the two. In very case three-phase installations are meant, as this method is acknowledged to be the best for such work." Motors might either be coupled to the shafting by claw couplings or by rope drive; the latter was rather easier on the motor, but needed frequent adjustment. In the author's opinion, the best system was a compromise between group and individual drive, using in each department two motors of half the total h.p. The Paper then reviewed the power required by the machines in the different departments of a mill of about 70,000 spindles. In the preparation department the highest horse power required by any individual machine was about 8 for the combined opener and lap machine, the other machines took from 2 to  $3\frac{1}{2}$  h.p. each, and the total for the department

was about 60-h.p., which could be conveniently divided between two motors. In the card room there would be from 110 to 120 carding machines, which could be driven by two 70-h.p. motors. If fine yarns were spun, combing machines, each taking about  $\frac{1}{2}$  h.p. would be used; but usually the next department was the frame room where the cotton coming from the carding machines in the form of a sliver passed successively through drawing, slubbing, intermediate, and roving frames. The first two took about  $1\frac{1}{2}$  h.p. each, the last two  $2\frac{1}{2}$  to  $2\frac{3}{4}$  h.p. The total for this room would be about 160 h.p. So far the load was very constant, and the steadier the drive, the more uniform was the material. The actual spinning was done either on mules or ring frames. Mules gave a load varying, in the case of a 75-h.p. motor driving two pairs of mules, from 40 to 120 h.p. This variation occurred about four times per minute. With electric motors, the corresponding slight speed variation was more gradual than with steam drive; the threads, being kept taut, were less liable to break, and a more even product resulted. Four or five mules should be driven by one motor to equalise the load, and the machines should be arranged so that the draw took place at different times. Ring frames took from 6 to 10 h.p. per frame. Individual drive was often used with provision for varying the speed of each motor, but the author preferred group driving, with about ten frames to each group, with three-speed pulleys to each machine. This avoided waste of power in the rotor rheostats, the heating of which was also objectionable. For some weaving purposes the yarn had further to be rewound on to large rollers in "winding and beaming" frames, which took about  $\frac{1}{2}$ -h.p. each, and steadiness of drive was also of great value here.

### THE ELECTRIC VEHICLE COMMITTEE

At a meeting of the Electric Vehicle Committee, appointed by the I.M.E.A., on February 20th, Mr. J. S. Highfield (Chief Engineer, Metropolitan Electric Supply Co.) represented the Incorporated Association of Electric Power Companies, and Mr. J. A. Phillips (British Thomson-Houston Co.) and Mr. R. A. R. Bolton (Siemens Bros. Dynamo Works) represented the B.E.A.M.A. motor and switchgear sections respectively. The Technical Sub-Committee's recommendation was approved, that the 150-ampere size of concentric charging plug and receptacle, recently standardised by the Electric Vehicle Association of America (see ELECTRICAL ENGINEERING, Feb. 19th, p. 105), should be adopted as the standard for Great Britain, and that where a plug of larger capacity was required, it should have the same diameters, but lengthened contacts. It was not considered necessary that any provision should be made for earthing the shell of the plug. This plug is at present being manufactured in America by the Albert & J. M. Anderson Mfg. Co., of Boston. It was recommended that cab-tyre sheathed cable be adopted for charging leads. Negotiations were reported regarding co-operation with the International Electrotechnical Commission and the Engineering Standards Committee. The Commercial Sub-Committee presented a report on tariffs, and it was decided to circularise electric supply authorities in order to ascertain at what minimum prices they would be willing to supply electric energy for charging electric vehicles. Correspondence with the Local Government Board was reported, in which the Board signified that they were prepared to entertain applications from local authorities for sanction to borrow money for the purchase of vehicles, but would not be disposed to suggest that any particular form of self-propelled vehicle should be purchased. A letter was also read from the Car & General Insurance Co., Ltd., intimating that reductions in insurance rates for electric vehicles as against petrol cars would be granted.

**London Electric Supply Bill.**—Reference was made at the annual meeting of the Metropolitan Electric Supply Co. on Tuesday to the London Electric Supply Bill. In the main, the remarks of Mr. W. Harrison Cripps, the Chairman of the Company, were on the lines of those at the other meetings already reported in our columns, but he added that it had been in the Directors' minds for some time that it might be desirable to make an application to Parliament for combining the existing companies in order to get more or less what was suggested under the present Bill. There had, however, he said, been an attempt to "jockey" them, and it would seem that it was the idea of the promoters to get a bill with the approval of the L.C.C. outside the companies, but in view of the opposition of the companies it was not improbable that the measure would be dropped.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,382.

A series wound 500-volt 50-h.p. crane motor is fitted with a shunt wound magnetic brake, and this is provided with a discharge coil to take the "kick" when breaking the circuit. State how the necessary resistance and current carrying capacity of the discharge resistance are arrived at, and give the rating of the resistance when working in conjunction with a one-hour rated motor. If the motor is compound wound instead of "series," could the kicking coil be dispensed with?—A. R. T.

(Replies must be received not later than first post, Thursday, March 19th.)

### ANSWERS TO No. 1,380.

How does the rating of pipe ventilated motors compare with that of totally and semi-enclosed machines? In the smaller sizes, say 10 h.p. at speeds from 600 to 1,000 r.p.m., how is the air circulation effected?—E. W. A.

The first award (10s.) is given to "MARP" for the following reply:—

The rating of a motor is the maximum load which it will carry for a period of six hours and conform to the prescribed tests, viz., the temperature-rise of the machine must not then exceed 40° C., 45° C., or 55° C., according as it is of the pipe-ventilated, semi-enclosed, or totally-enclosed type. The ratings for pipe-ventilated and semi-enclosed machines are generally found to be so nearly alike that it has become standard practice to adopt the same rating for both types. The following table shows a few typical ratings for pipe-ventilated and totally-enclosed motors:—

110 Volts.				220 Volts.				440 Volts.			
Totally Enclosed.		Pipe Ventilated.		Totally Enclosed.		Pipe Ventilated.		Totally Enclosed.		Pipe Ventilated.	
Speed.	H.P.	Speed.	H.P.	Speed.	H.P.	Speed.	H.P.	Speed.	H.P.	Speed.	H.P.
1000	1	860	1½	900	1	780	1½	521	1	450	1½
970	2	840	2½	1650	2	1400	2½	950	2	820	2½
1150	5	1000	6½	1600	5	1325	7	1150	5	1030	6½
840	10	700	12½	875	10	750	13	625	10	540	13
310	20	260	26	690	20	575	27	320	20	270	25
590	30	500	40	390	30	320	40	380	30	300	37
650	40	520	60	570	40	480	53	560	40	460	58
625	50	500	80	760	50	650	75	480	50	400	71

From the above it will be observed that the outputs for pipe-ventilated motors are considerably greater than those for

the corresponding sizes of totally-enclosed machines. The effect of ventilation is especially marked in the case of overload ratings. Whereas a pipe-ventilated motor will stand a 25 per cent. overload for one hour and a 50 per cent. overload for one minute without injury, a totally-enclosed motor cannot with safety be loaded above 25 per cent. for more than a few seconds. The circulation of air through the machine is usually effected by the use of radial ducts in the armature. The standard practice is to insert a cast-iron space-block between the armature stampings every 8 in. For a 10-h.p. motor these air-ducts would be about ¾-in. wide. When the armature rotates, centrifugal force causes the air to move towards the outer edge of the armature, where it escapes, fresh air being drawn in at the centre. In the case of pipe-ventilated machines, a fan is fixed at the commutator end of the shaft, inside the case, and the cool air is thus forced axially along the armature, which is provided with axial air-ducts to assist the circulation. Where motors are used only intermittently, such as for crane work, the ratings are somewhat higher than those for continuously used machines. The rated load is then defined as the maximum load which the motor will carry for a period of one hour, and conform to the tests mentioned above.

The second award (5s.) is given to "W. H.," who writes as follows:—

Generally speaking a pipe-ventilated motor will give the same output as a similar size machine of the protected type, therefore as a semi-enclosed motor is presumably one with some form of protecting covers, such as perforated or expanded metal, the rating of such a motor would be slightly lower than that of a pipe-ventilated motor of similar size. If, however, the semi-enclosed motor is also fan ventilated, the output could be slightly increased, with the result that both types of motors would give about the same output. The characteristics of various makes of motors would vary the results outlined above a little one way or the other, depending as to whether the individual motor was adapted for pipe ventilation. For instance, in the case of D.C. machines, owing to the large air space in the interior of the frame, the pipe-ventilated motor would usually give slightly more output than the protected or semi-enclosed motor (unless, of course, the latter were fan ventilated); whereas in the case of induction motors, owing to the restricted air space in the frame, the opposite result would usually be obtained. In all the preceding statements it is assumed that an efficient fan is driving a sufficient quantity of air through the machine, and this is a matter which requires careful calculation, as otherwise either overheating will result if the quantity is too small, or a loss in efficiency will result if the volume of air passed is too large.

In the case of totally enclosed machines, quite a different problem arises; we are now dealing with machines in which the heat is not carried away by air coming in contact with the heated coils, but by radiation from the frame. From this it will be seen that the output of a totally enclosed motor depends to a large extent on the total radiating surface of the machine.

Again it depends to some extent on the peripheral velocity of the armature or rotor, and also upon the movement of the air inside the frame. For instance, introducing a fan into a totally enclosed machine will allow of a considerably increased output. This is probably due to the impinging of the heated air on the inside of the frame, and also to the breaking up of any hot air pockets which would otherwise form and limit the output by producing excessive local heating.

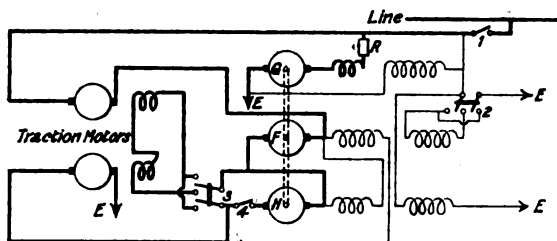
A fairly accurate formula for the permissible loss in totally enclosed motors is given below:— $W = (0.0044 + 0.0012 V)$  where  $W$  = watts dissipated per square inch of outside surface per degree C., and  $V$  = peripheral velocity of armature or rotor in thousands of feet per min.

From average results with a reasonable design of machine a totally enclosed motor at moderate speeds will develop about six-tenths of its output as a pipe-ventilated motor. At low speeds the totally enclosed output would be proportionately rather higher, and at high speeds, owing to the excessive core loss, the proportion would be lower until a speed is reached at which the core loss alone is equal to the maximum watts that the machine will dissipate. In this latter case the motor would, of course, develop no useful power.

With regard to the latter portion of the question, the air circulation of pipe-ventilated, direct-current motors would be quite good, but for reasons previously mentioned the corresponding size of induction motor would be slightly adversely affected by pipe ventilation.

## ELECTRIC TRACTION NOTES

A system of multiple unit control in which a booster set is used has been tried on the Metropolitan Railway of Paris, and has shown a great power saving. According to an article by Mr. C. Jacquin in the *Electric Railway Journal* (New York), the control depends on the Ward-Leonard principle, in which the pressure across the traction motor armature is varied by a motor-generator set. The motor field currents are varied independently by means of another motor-generator set mechanically and electrically associated with the first. The diagram shows the general scheme of connections. F, G, and H represent the motor-generator set. F and G represent the booster group, and H a small regeneration dynamo. F is always in series with the traction motors through the two-way switch 3. By means of switch 4 the regeneration dynamo is joined in parallel with the field coils of the traction motors. This machine serves to vary their excitation. In starting from rest, switch 1 is closed, and the booster group brought up to normal speed by means of the



resistance R. Switch 3 is then closed according to the direction of propulsion. At first the E.M.F. of F opposes the line pressure, and so F motors G as a generator, which therefore returns energy to the line. As the traction motors accelerate, however, the pressure across F falls to zero, and the traction motors are simply in series. Then G motors F as a generator, and a pressure equal to the line pressure, and in the same direction, is produced across the traction motors. Thus the equivalent of ordinary parallel operation is obtained. Test curves show an energy-saving of about 20 per cent. with this control. During running the control acts automatically to maintain a constant current. The weight is about 4,070 lb. per motor car, but two contactors, reverser and starting resistances, weighing 990 lb., are eliminated.

At the annual general meeting of the London & North Western Railway it was stated that it is hoped to have the power-house at Stonebridge Park completed by the spring of next year, and simultaneously through services running from Watford to Broad Street, as well as with the Bakerloo Railway. It is also anticipated that the electric train service will be running between Willesden and Earl's Court in April or May this year.

Reference was made at the annual meeting of the Midland Railway to the progress of the electrification of the line to Southend. The  $7\frac{1}{2}$  miles of track from Barking to Upminster is to be widened to four lines, and in connection with the electrification scheme the General Manager, having paid a visit to America, has come to the conclusion that even if there was no obligation on the Company to electrify the line, this would be necessary sooner or later in order to cope successfully with the rapidly increasing population in the Tilbury and Southend district, and the important extension which the Port of London Authority is effecting at the Docks. The estimated cost of the work is about £900,000, and it is for this purpose that new capital powers of £1,000,000 are being asked for in a Bill this session.

The accounts of the Liverpool Corporation Tramways for 1913 show that after meeting capital charges and placing £54,163 to reserve, renewal and depreciation, a contribution of £100,000 is made in aid of the rates. The net profit for the year amounted to £154,162, which is an increase of £20,304 over 1912. The contribution to relief of rates is £33,071 in excess of the amount handed over for this purpose in 1912.

The proposed tube railway under the Tyne between North and South Shields, in connection with which a Bill has been deposited this session, has been abandoned by the promoters. A similar scheme was actually sanctioned by Parliament some years ago, but the powers were allowed to lapse. The share capital of the proposed company which has now been abandoned was £265,000.

The Brighton Corporation has given official notice of its intention to go to arbitration to settle the differences between itself and the Hove Corporation as to the trolley omnibus system.

The annual meeting of International Railophones was held last week, when it was stated that although considerable efforts are being made to interest the German Imperial Railways in the system, the energies of the Company have been devoted in this country to the trial plant on the Midland Railway. Almost immediately after the Aisgill railway accident the Midland Railway Co. decided to instal at its own expense a trial plant just outside Derby. Negotiations are now going on for the sale of the British and American patents.

A proposal by the directors of the Bath Electric Tramways Co. to postpone the preference dividend for four years in order to repay certain overdrafts to the bank, has been received with a good deal of dissatisfaction, and a committee has been appointed to confer with the Board as to the best arrangement for financing the Company. The past year has been the best in the history of the Company as regards mileage run, traffic receipts and net earnings.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Telegraph engineers will be very sorry to hear of the death of Mr. John Gott, Consulting Electrician to the Commercial Cable Co., on Sunday last. Mr. Gott, who was seventy-four years of age, has been actively associated with the development of submarine telegraphy, and at the time of his death was engaged on perfecting a signalling system to avoid re-transmission, and to eliminate the syphon recorder. The impulses in this system are alternately positive and negative (*ELECTRICAL ENGINEERING*, February 27th, 1913, p. 20, and April 3rd, p. 193).

The reorganisation scheme of the British wireless coast stations, which is now in progress by the Post Office, is dealt with by Mr. E. S. Perrin and F. W. Davey in the current issue of the *Post Office Electrical Engineers' Journal*. The scheme provided for the purchase of the station at Cullercoats from the Poulsen Co. The transmitting apparatus is of the ordinary De Forest direct-coupled type of about 2 kw. At the North Foreland station the power plant has been duplicated and the original apparatus improved. Five new stations have been built at Niton, St. Just, Fishguard, Malin Head, and Valencia (West of Ireland). These use musical notes with spark frequencies of 300, 400, 300, 400, and 600 respectively. The power used in these stations is now  $1\frac{1}{2}$  kw., 5 kw., 3 kw., 5 kw., and 10 kw. respectively. The old stations at Lizard and Rosslare are superseded. The first station to be designed by the Post Office is the one at Fishguard. The arrangement is similar to that at North Foreland. A 3-kw. motor alternator is supplied with power derived for the G.W. Railway Co.'s station, and feeds a high-pressure transformer at about 300 volts 150 cycles through an iron-core choking coil. The transformer secondary is connected through two air-core choking coils to a rotary disc discharger. There are two circuits from the discharger—one tuned to a 600-metre wave and the other to a 300-metre wave. The same aerial is used whichever circuit is operative, but in the latter case, however, direct-coupling, and in the former case inductive coupling, is used. The secondary pressure of the transformer is 7,860 volts, but it is insulated to withstand a working pressure of 17,500 volts. The discharger has twelve studs. There are two discharging points, arranged so that the studs are opposite both at the same instant. It is capable of fine adjustment on the alternator shaft. The mast for the aerial is an ordinary three-part ship's mast, 150 ft. high, recovered from the old Seaforth wireless station. The anchorages are made up of best railway metals set in concrete. As the ground is rocky, the type of earth provided gives a capacity earth in addition to the ordinary earth. The receiving gear is connected across the earth arrester gap and consists of a multiple tuner which can be worked with either a magnetic or crystal detector. Low-resistance telephones are used. The range of this station is reckoned about 250 miles in the daytime, but it has taken traffic at 1,200 miles at night. The connections and general lay-out of the internal transmitting plant at St. Just follow closely on the lines of Fishguard, except that two aeriels are used. Power is generated on the premises. Malin Head is also similarly designed, but there is only one aerial. The

stations at Valencia and Niton will shortly be completed. The three other large stations included in the scheme are those at Caister, Crookhaven (West of Ireland), and Seaforth, and there are also several smaller stations for special purposes.

The Committee for Radiotelegraphic Investigation of the British Association proposes to undertake a special investigation into the effect on the propagation of electric waves of the total eclipse of the sun on August 21st next, which will be visible in Greenland, Norway, Sweden, Russia and Persia. It is desired to study the effect of the period of darkness on the strength of signals, and also the variation produced in natural atmospheric discharges. The co-operation of stations in various parts of the world is invited, and those willing to make observations and record them on special forms supplied by the Committee, are asked to communicate with Dr. W. H. Eccles, University College, Gower Street, W.C.

Mr. Hobhouse, in reply to a question in the House of Commons on Thursday last, gave some further particulars as to the rearrangement of the African stations of the Imperial wireless chain, whereby the Egyptian station will communicate with England (1,950 miles), India (2,560 miles), and East Africa (1,900 miles). No further formal agreement will be necessary with the Marconi Co.

On Monday a House of Lords Select Committee was appointed to inquire into Lord Murray's dealings in Marconi shares in connection with the Imperial wireless chain, at the time the Post Office was negotiating with the Marconi Co. The Committee consists of Lord Halsbury, Lord Loreburn, Lord Sanderson, Lord Desart, and Lord Charnwood.

The British L. M. Ericsson Manufacturing Co. shows a profit of £37,738 for 1913, and an 8 per cent. dividend is declared. The sum of £10,508 is transferred to depreciation, and a reserve with a sum of £5,000 has been started.

The Paramaribo-Cayenne cable of the Compagnie Française des Câbles Télégraphiques was repaired on the 2nd inst., and the Persian lines between Shiraz-Kazeroon were down on the 14th inst.—The Bassorah-Fao line was not working on the 5th, and also, as from this date, deferred telegrams were admitted by Morocco.—Failures occurred in the Teheran-Meshed line and the Perim-Djiberiti cable, and these and the Fao line were repaired on the 6th inst.—The Shiraz-Kazeroon line was again working on the 7th inst., and the Oran-Tangier cable on the 8th.

**Popularising Electricity.**—In order to increase the number of consumers and the loads of existing ones, the South Metropolitan Electric Light & Power Co., Ltd., is promoting a well-arranged Exhibition at its offices and showrooms, 181-185 High Street, Lewisham, S.E., from to-day until Saturday 21st. The Company has permanently enlarged its showrooms, and is now enabled to show representative examples of all kinds of lighting fittings and heating and cooking apparatus, as well as the numerous useful and ornamental small accessories, to the greatest advantage. During the Exhibition two of the offices on the first floor have been completely fitted up to demonstrate how useful electricity can be in the bedroom and dining-room. These rooms are most artistically arranged. Short lectures are given several times daily. In the course of these, an offer is made to wire the smaller houses in the Company's area complete for nine lighting points, complete with fittings, lamps, shades, switches, &c. The Company estimates what the lighting bill should be, and if after three months this exceeds the estimate by more than 10 per cent., the Company will remove the installation without charging the consumer anything except the energy charge for the three months. If, however, the Company are correct in their estimate, the consumer is to pay the net cost of the installation by cash down, by instalments spread over three years, or a quarterly rental can be paid. Some literature has been prepared in connection with this campaign, which is one which should bring substantial results to the Company whose enterprise worked it out. A feature of the energy charge for heating and cooking is that if during the summer quarters no energy is taken for these purposes, no charge is made for the meter rent.

**Miners' Safety Lamps.**—Mr. S. B. Haslam has written us to point out that the condensed version of his remarks at the meeting of the Association of Mining Electrical Engineers, published in our "Summary" last week, is not entirely accurate. As stated in the fuller report of the discussion on p. 130 of our last issue, Mr. Turquand, in his Paper, estimated the life of the secondary battery of a miner's lamp at 500 charges and discharges. Mr. Maurice pointed out that 500 shifts meant about 20 months, and estimated the average life at only about a half of this. Mr. Haslam agreed with Mr. Maurice that this was about the life of the positive plate (which in his experience with "Ceag" lamps lasted 8 to 12 months), but said that the negative plate would last twice as long.

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## "ELECTRICAL ENGINEERING" PATENT RECORD

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### Specifications Published March 5th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

28,513/12. **Ignition.** F. G. L. BIBBLECOMBE and G. THOMAS. To provide two or more sparking circuits for the ignition of internal combustion engines, in which ordinary plugs may be used, one circuit remains as usual and the others are inductively coupled to it. Both circuits are earthed. An external spark gap is provided in the main circuit to ensure that the added circuits will continue to work on a failure of the first sparking plug. Three figures.

788/13. **Submarine Telephony.** A. WILLIAMS. The insulation is made somewhat leaky, and a "pilot" or "escort" current, which is sent through the cable, insulates the high frequency impulses by its polarising effect. It is said that the capacity is practically eliminated. One figure.

802/13. **High Frequency Currents for Wireless.** G. MARCONI. Wires are arranged on the surface of a cylinder parallel to its axis, and connected at opposite ends. They are in series with a source of current. A co-axial cylinder is similarly arranged, and one or both is rotated. Four figures.

4,773/13. **Commutation.** B. LJUNGSTRÖM and A. D. WIDSTRÖM. The risers to the commutator form one of the windings of a transformer. The other winding is connected with a synchronous A.C. generator producing a frequency equal to the frequency of commutation. It is arranged that the number of phases is one less than the number of segments with which the brushes can be in contact simultaneously. The E.M.F.'s in the two risers of each short-circuited coil are opposed by the transformer E.M.F.'s. Six figures.

27,348/13. **Multiple Recording Instruments.** HARTMANN & BRAUN A.-G. Bodies bearing different marking colours take the form of an endless chain, so arranged that on the change over of the recording mechanism to a fresh circuit a forward motion of the series of colours is automatically effected. The chart is between the colours and the marker. Ten figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** A. W. PENROSE & Co. and OWEN, 26,913/13; KORTING & MATHIESEN A.-G., 27,878/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** LEITNER [Automatic supply systems] 1,413/13; B. T.-H. Co. (*G. E. Co., U.S.A.*) [Insulation] 8,417/13; FERGUSON and JOHNSTONE [Lighting, heating, and ventilating moving vehicles] 9,009/13; WADE (*Schneider and Naujoks Elektrizitäts Ges.*) [Lighting operating tables] 10,098/13; B. T.-H. Co. and MCCARTHY-JONES [Automatic circuit regulation] 25,163/13.

**Dynamos, Motors, and Transformers:** VANDERVELL and MIDGLEY [Commutating arrangements] 5,014/13.

**Electrometallurgy and Electrochemistry:** SCOTT [Electrode for nitrogen fixation furnaces] 4,723/13 and 4,724/13; [Regulation of arc furnaces] 4,725/13; MARGUET [Sodium and other alkali metals] 11,278/13; MACK [Transformers and welding, smelting and similar apparatus] 19,512/13.

**Ignition:** TATE [Engine starting] 5,818/13; MARKS (*Siemens & Halske A.-G.*) [Spark plug] 17,514/13; RENAULT [Engine starting] 18,252/13; UNIONWERKE MEA GES. ELEKTROTECHNISCHE FABRIK EISENWERK [Contact breaker] 23,739/13.

**Incandescent Lamps:** GIUSTI, 8,568/13.

**Instruments and Meters:** PHILLIPS and SMITH [Moving iron] 13,844/13; SIEMENS BROS. (*Siemens & Halske A.-G.*) [For high-frequency currents] 17,126/13.

**Storage Batteries:** DE SEDNEFF, 1,066/13; HEAP and CHLORIDE ELECTRICAL STORAGE CO., 6,462/13.

**Switchgear, Fuses and Fittings:** SPAGNOLETTI and JOYCE [Fuses] 3,111/13; SIEMENS SCHÜCKERTWERKE GES. [Fuses] 6,880/13; LUNDBERG and PEGG [Switches] 7,085/13; BLACK [Contact-makers] 8,561/13; CONNER and KAHL [Switches] 14,816/13; HUBBELL [Locking of lamps] 15,576/13; VOIGT & HAEFFNER A.-G. [Polyphase motor starters] 19,648/13; SIEMENS BROS. (*Siemens & Halske A.-G.*) [Connectors for electro-medical apparatus] 25,141/13.

**Telephony and Telegraphy:** POLLEN and ISHERWOOD [Order telegraphs] 4,164/13; WESTERN ELEC. CO. (*Western Elec. Co., U.S.A.*) [Selective signalling] 4,618/13; CHAMBERS [Apparatus for wireless] 4,777/13; GRAHAM and RICKETS [Order telegraphs] 4,829/13; MARKS (*Submarine Wireless Signalling Co.*) [Submarine signalling] 5,250/13; BREGUET and FRÈRES BREGUET ET CIE [Prepayment automatic telephones] 8,615/13; CLORIUS [Con-

tact and fire alarm] 8,741/13; DITCHAM and GRINDELL-MATTHEWS WIRELESS TELEPHONE SYNDICATE [Production of oscillations for wireless telephony] 14,927/13; SIEMENS & HALSKE A.-G. [Semi-automatic telephony] 21,766/13; GRAHAM [Telephone exchange switchboards] 27,754/13.

**Traction:** A. G. BROWN, BOVERIE [Hauling plant] 26,430/12; MARKS (*Gilman*) [Railway signalling] 7,585/13.

**Miscellaneous:** THOMSON (*Seemann*) [Displaying illustrations synchronously with the operation of a talking machine] 3,715/13; HOPKINS [Tachometers] 4,671/13; LA PEARL [Changeable sign] 16,752/13; NICHOLAS [Mine signalling] 17,816/13; STANLEY [Insulated receptacles] 17,832/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** CARL ZEISS [Search lights] 1,714/14.

**Ignition:** GIORGI [Engine starting] 1,771/14.

**Switchgear, Fuses and Fittings:** SCHÖELLER & Co. [Ampere- and volt-meter for vehicles] 27,473/13; A. E. G. [Current collectors] 3,594/14.

**Telephony and Telegraphy:** VON LEPEL [Periodically modifying high frequency currents] 3,171/14.

**Miscellaneous:** MCKAY [Portable electric lamp] 2,495/14.

### Amendments to Specifications

7,524/12. **Signalling on Road Vehicles.** O. F. WERNDORF. As a result of the extended investigation under Section 8, a statutory reference to specification No. 2,667/12, in the name of G. S. Matthews, has been inserted in the specification, which deals with signalling the intended movements of a vehicle.

18,689/12. **Arc Lamp Electrodes.** B. T.-H. Co. (*G. E. Co., U.S.A.*). This specification, relating to electrodes of carbon, an earth titano-fluoride and an alkaline titano-fluoride, has now been amended by way of disclaimer under Section 8.

29,389/12. **Refractory Material for Furnaces, &c.** B. T.-H. Co. (*G. E. Co., U.S.A.*). This specification relating to a refractory material of silica, carbon, or aluminium silicate and manganese oxide, has been amended by way of disclaimer.

### Grant of Patents Allowed

3,878/12. **Shaft Rotation Indicators.** P. R. KEEPIE and H. M. R. MADDICK. The Law Officer has decided to allow the Grant of this Patent, thus upholding the Comptroller's decision.

9,673/12. **Shaft Rotation Indicators.** J. C. CLARKE and CHABURN (SHIP) TELEGRAPH CO. The Law Officer has decided to allow the Grant, thus upholding the Comptroller's decision. 1,420/13 and 1,439/13. **Electrolysis.** H. M. DU BOIS. The Comptroller has decided to allow the Grant of these Patents (see ELECTRICAL ENGINEERING for Oct. 23, 1913, p. 596), subject to the specifications being amended.

### Restoration of Lapsed Patent

14,495/06. **Railway Signalling.** W. REID. This Patent, which lapsed owing to non-payment of the renewal fee, has been restored.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

5,046 of March 16th, 1900. **Electrolytic Mercury Meters.** A. WRIGHT and REASON MFG. CO. The current which has passed through the meter is registered by utilising the decrease in weight of the mercury anode, or by the increase in weight of the cathode. In either case the electrode is made movable and adjusted to move after a given decrease or increase in weight. In the latter case the cathode is provided with a receptacle to catch the mercury which may fall off the cathode itself. A motor-driven counting train may be used.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, &c.:** L. WILSON [Automatic feeder protective gear to cut out a faulty feeder only] 25,219/04; A. J. BOULT (*J. L. Woodbridge, U.S.A.*) [Regulation of D.C. circuits fed by a storage battery and converter] 25,934/05.

**Dynamos and Motors:** ALLMÄNNA SVENSKA ELEKTRISKA AKTIEBOLAGET and J. L. LA COUR [Polyphase commutator machines] 24,581/08.

**Electrochemistry and Electrometallurgy:** A. LÉVY [Simultaneously cleaning and plating metal articles] 25,553/07; W. BORCHERS [Reduction of titaniferous iron ores] 24,590/08.

**Incandescent Lamps:** A. C. HYDE [Iron-nickel leading-in wires] 24,918/04.

**Switches:** J. APPLEBY and A. E. DREW [Time switches] 24,618/08; M. W. BRÖNDUM [Time switches] 24,793/08.

**Miscellaneous:** E. J. REID and W. B. GOOD [Signalling for pneumatic tubes] 24,909/08.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 153. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**CINEMATOGRAPH THEATRE SUPPLIES.**—A new list entitled "Everything Electrical for Cinemas, Theatres, and Public Buildings Generally" has just been issued by the Supply Department of the British Westinghouse Co., Ltd. (Long Millgate, Manchester). This is as complete as its title would indicate, and contains particulars of incandescent, mercury-vapour, and arc lamps and accessories, carbons, lighting fittings, including many designs for indirect and semi-indirect lighting, hand lamps, number indicators, signs and illumination material, stage lighting accessories, fans, heaters, and vacuum cleaners, &c. The company will send a copy to anyone if the request is accompanied by a trade card. The company asks us to state that they are holding a special exhibition of this class of apparatus at 179 Wardour Street, W., from March 16th to 23rd.

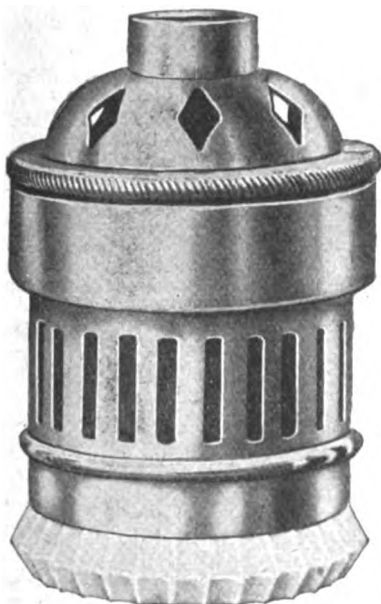
*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**MOTOR-CAR WIRING.**—A leaflet from Siemens Brothers & Co., Ltd. (Woolwich), gives particulars of special leads for motor-car ignition circuits, including five varieties of low tension and the same number of high-tension cables, some braided, and some plain rubber covered.

**INSULATING MATERIAL.**—We have received from the Paracit Co., of Frankfort-on-the-Maine, a pamphlet in German discussing the general question of insulating varnishes, and describing the company's special compound known as "Paracit." Interesting results of tests of dielectric strengths are given of various qualities of the material tested under different conditions.

### HOLDERS FOR HALF-WATT LAMPS

WE have received particulars from the British Thomson-Houston Co., Ltd., of an improved type of



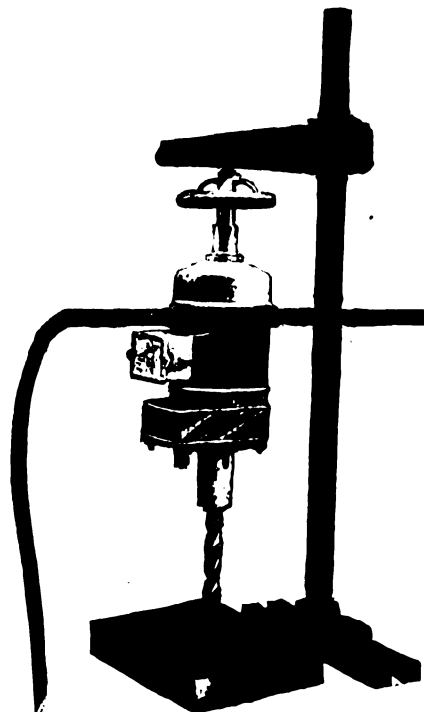
VENTILATED "GOLIATH" HOLDER FOR  
HALF-WATT LAMPS.

"Goliath" holder for half-watt lamps. The ordinary "Goliath" holder is somewhat unsightly, because of its size,

but the graceful lines and neat design of the new holder make one oblivious of mere dimensions. The holder is made of brass, and the case is ventilated by vertical apertures around the lower part, and lozenge-shaped apertures around the top. Ventilation between the cap of the lamp and the interior of the holder is secured by means of a vertical channel cut across the thread of the holder. For interior lighting it is an advantage to have a holder which is so good-looking that no elaborate precautions need be taken to conceal it. The new B.T.H. "Goliath" holder, as well as several other patterns, including brass and porcelain holders, fitted with cord grip, suspension hook, or drilled and threaded tops, can be seen and purchased at Mazda House, 77 Upper Thames Street, E.C.

### ELECTRIC DRILLS

IN the early days of electric drills there was a strong tendency in some quarters to reduce the dimensions of such apparatus below the point necessary for reliability, with the result that their reputation suffered. Experience in running and in design has, however, now renders it possible to produce a more compact and lighter electric drill than formerly without sacrifice of other good qualities, and a



WITTON-KRAMER ELECTRIC DRILL.

good example of a modern design is the "1914 Runthru No. 5" drill, constructed by the Witton Kramer Electric Tool & Hoist Co. (for whom the General Electric Co., Ltd., 67 Queen Victoria Street, E.C., are the sole selling agents), which we illustrate here. In this a considerably more powerful tool has been produced without any increase in weight, which stands at 57 lb. These improvements have been effected mainly by reducing the waste space in the top cover and gear-box, and have not in any way been procured by a reduction in the strength or efficiency of the mechanical or electrical working parts. This tool will drill a 1½-in. hole in cast-iron at the rate of 1 in. per min.

## THERMAL CIRCUIT-BREAKERS

WE have received from Morris & Lister (London), Ltd., 3 and 4 Palace Chambers, some interesting information and particulars as to the application of the thermal principle to circuit-breakers. The protection of circuits by thermal means in the form of ordinary fuses is still practised to a very large extent, in spite of its disadvantage of spark-production and inconvenience in replacement, and this is largely due to its power of taking into account the duration

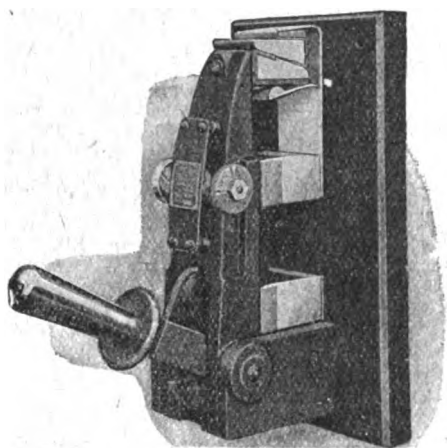


FIG. 1.—SINGLE-POLE CIRCUIT-BREAKER.

as well as the magnitude of the overload. It was with the object of retaining this latter feature, while doing away with the objections of the ordinary fuse, that Messrs. Morris & Lister took in hand the design of their thermal circuit-breaker. The latest forms of this are illustrated in the accompanying figures, and their general principle is as follows:—The cradle of the breaker is provided with a spindle, around the axis of which move the handle lever, a push-in piece or catch carrier provided with a mushroom-headed bolt, and the main arm carrying the contact blocks. Between the two main contact blocks two thermal strips of metallic alloys are fixed, and carry either the whole or a definite shunted part of the main current. When the breaker is "in," the contact blocks bed on brushes attached to the base. When the handle lever is pushed upwards to put the breaker in, it presses on the push-in piece and causes the mushroom bolt to engage the spring catches which are provided on the

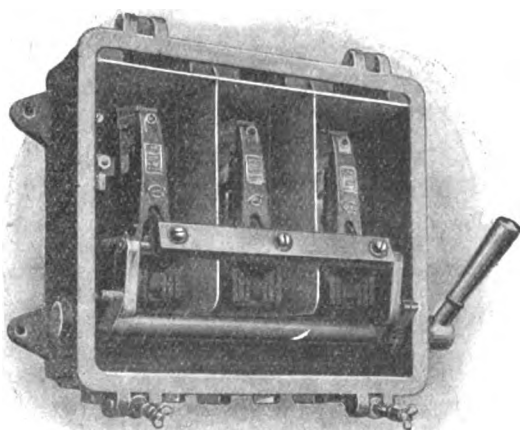


FIG. 2.—THREE-POLE ENCLOSED TYPE.

strips, and thus throws the main arm on to the brush contacts. When the main arm is well home, the push-in lever is locked in place by a spring which engages with a catch. When an overload of sufficient duration occurs, the strips become slightly heated, expand, and allow their catch-pieces to slip over the head of the mushroom-bolt, permitting a pull-out spring to act and throw the switch-lever into the "out" position. As the main arm comes out, cam surfaces at its lower end press down the retaining spring and release the push-in lever also. Before the circuit-breaker can be

## Time Costs Money



and Machining takes time and moreover does not always give perfect interchangeability — an essential requisite of such pieces as that here shown.

## "PRANA" DIE-CASTINGS

save machining—*ergo*, time and money, and are accurate, reliable and interchangeable.

**BUT THEY MUST BE "PRANA"**  
—British made; "tough and true."

Write for Leaflet E.E. 6 to  
**AERATORS Ltd.** UPPER EDMONTON, LONDON, N.

closed again the locking mushroom bolt must be drawn back through the catch-pieces by pressing the handle downwards. Auxiliary metal and carbon contacts are provided, as well as the main contacts, and a magnetic blow-out can be added if desired. Special no-voltage release devices of simple design are employed where required. The temperature of the

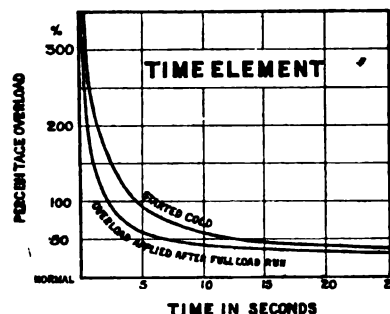


FIG. 3.—CURVE SHOWING TIME ELEMENT FEATURE.

strips never exceeds a very moderate figure. Variations of the temperature of the surrounding atmosphere are compensated for by the expansion or contraction of the parts to which the strips are fixed. These breakers possess all the advantages of the free-handle feature, and are equally suitable for continuous or alternating currents.

**Long Life of Carbon Lamps.**—The Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), have received some remarkable testimony of the durability of their carbon lamp. It appears that a travelling crane lighted by 13 lamps had a serious collision, but although all had been running 1,600 hours, none were damaged. In their subsequent careers seven of these lamps completed lives varying from 1,950 to 4,900 hours, and the remainder are still intact. These records are, however, beaten by a Royal Ediswan carbon signalling lamp on one of the Northern Railways, which gave its light for 22,607 hours, equivalent to a continuous run of more than two years and a half.

**Bruce Peebles Staff Ball.**—The annual staff ball of Bruce Peebles & Co., Ltd., Edinburgh, was held on February 27th, at the North British Station Hotel. In the speeches which were made at the supper it was pointed out that not only had the Company had a successful year, but 1914 was promising to be better still. The honours of the evening were shared by the joint managers of the Company, Messrs. S. E. Bastow and J. H. Bunting, the former, with Mrs. Bastow, holding a reception at the beginning of the evening, and the latter presiding over the supper.

**Alkaline Accumulator Manufacture.**—The Hagen Accumulator Works, in addition to holding a licence under the Jungner patents for the manufacture of alkaline storage batteries, has also acquired from the firm of Erwin Achenbach, Hamburg, the rights of the Achenbach-Pörske alkaline cell.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Bedford.**—Twelve months' supply of high- and low-tension cables, meters and metal filament lamps. Borough Electrical Engineer. April 1st. (See advertisement on another page.)

**Carlisle.**—A Local Government Board inquiry was held last week concerning a loan of £29,940 for electrical extensions. There are at present in hand applications for 520 kw.

**Colchester.**—Mains extensions are to be carried out in a number of streets.

**Dartford.**—In connection with the application for a loan referred to on page 109 of our issue for February 19th, the L.G.B. has suggested that the Council should call in a consulting engineer to report upon the position in respect to the standby plant. No objection is taken to the proposed agreement with the West Kent Electric Power Co.

**Derby.**—An expenditure upon the electricity undertaking amounting to £12,540 is contemplated.

**Dover.**—Mains extensions at an estimated cost of £370 are to be carried out.

**Dundee.**—Twelve months' supply of electrical stores. General Manager, March 20th.

**Dunfermline.**—The Fife Electric Power Co. intends to increase considerably the plant at its Townhill power station.

**Exeter.**—It is proposed to instal a 1,000-kw. high-pressure turbo-alternator at an estimated cost of £6,200.

**Farnworth.**—A 500-kw. rotary-converter, transformer, switchgear, and cable are required. Borough Electrical Engineer. March 18th.

**Halifax.**—Application is to be made for sanction to a loan of £7,000 for the purchase of a 1,000-kw. 50-cycle rotary-converter, switchgear, water-tube boiler and mechanical stokers.

**Malvern.**—The question of installing a new generating set, or taking a bulk-supply from the Worcester Corporation, is under consideration. Further reference is made to the matter in our Local Notes columns.

**Rawtenstall.**—Water-tube boilers, superheaters, mechanical stokers. Borough Electrical Engineer. March 23rd.

**South Africa.**—According to the *African World*, the Cape Town Council proposes to borrow £100,000, and the Lady-smith Council £7,000, for electrical purposes.

**South Shields.**—Induced draught plant motors and control gear. Borough Electrical Engineer. March 13th.

**Street (Somerset).**—A contract for street electric lighting is under consideration by the Council.

**Swindon.**—Cooling tower. Borough Electrical Engineer. March 18th.

**Swinton and Pendlebury.**—Twelve months' supply of cable, joint boxes, joint box compound, &c. Borough Electrical Engineer. March 26th.

**Torquay.**—A loan of £5,000 is to be taken up for mains extensions.

**Walsall.**—Loans of £2,092 for plant extensions, £1,092 for substation equipment, and £1,000 for mains are to be applied for.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bradford.**—Cinematograph theatre. Architect, J. Jackson, Sunbridge Road.

**Glacton.**—New municipal offices.

**Crowe.**—New co-operative bakery. Architect, G. E. Bolshaw, 106 Lord Street, Southport.

**Holmfirth.**—The new Council school is to be wired.

**Manchester.**—Electric lighting installation at Heald Place school, Rusholme. Town Clerk. March 18th.

**Middleton.**—New town hall.

**Newport.**—New town hall.—New works for British Mannesmann Tube Co.

**Nottingham.**—New baths at Muskham Street. City Architect.—Children's Home for Guardians. Architects, Sutton & Gregory, Bromley House.

**Rochdale.**—New school.

**Swansea.**—Isolation hospital buildings. Architect, H. A. Ellis, 10 Fisher Street.

**Torquay.**—New technical school.

**Walsley.**—New town hall.

### Miscellaneous

**Barrow-in-Furness.**—The pumping plant at Salt House is to be converted to electrical drive. Borough Electrical Engineer.

**Clacton-on-Sea.**—The lighting of the principal streets with arc lamps has been delegated to a special committee for report.

**London.**—Tenders are invited for a twelve months' supply of electrical stores for the War Office. Director of Army Contracts.

Telephone installation at the infirmary, Brook Street, Kennington. Lambeth Board of Guardians.

**Monmouth.**—Some hundred street gas lanterns are to be replaced by electric lamps.

**Ruislip-Northwood.**—Tenders are invited for the lighting and maintenance for street lamps for twelve months. Surveyor. March 30th. (See advertisement on another page.)

## TENDERS RECEIVED AND ACCEPTED

**Croydon.**—Messrs. Siemens Bros. Dynamo Works have received the annual contract for the supply of "Tantalum" traction lamps and "Wotan" drawn-wire lamps.

**Derby.**—An offer by Messrs. C. A. Parsons & Co., for a 2,000-kw. turbo-alternator at £7,017 has been accepted.

**Ipswich.**—The following tenders have been accepted:—Alternator, rotary-converter, automatic voltage regulator and switchgear, British Westinghouse Co., £2,212 13s. 3d.; three 50-kw. transformers and testing transformer, Ferranti, Ltd., £194; high- and low-tension switchgear for main power station and sub-stations, Voigt & Haefner (England), £1,992 16s.; two rotary-converters for Duke Street converter sub-station, British Westinghouse Co., £1,566; high- and low-tension underground cables, The Ateliers de Constructions Electrique du Nord et de l'Est (Agents, H. W. Butler & Co., London), £6,157 15s.; fused mains disconnecting boxes for four-core three-phase L.T. distributors, W. Lucy & Co., £196 (excluding fuses); services boxes, British Insulated & Helsby Cables, £40 4s.

**Liverpool.**—The Tramways Committee has placed an order with Dick, Kerr & Co. for motor equipments.

**London: Hackney.**—The Electricity Committee recommends the placing of a contract with Messrs. Willans & Robinson for a 5,000-kw. turbo-alternator with condensing plant and accessories at £13,500, and with Messrs. Ferranti, Ltd., for switchgear extensions at £374.

**Manchester.**—The following tenders have been accepted:—Two water-tube boilers, Babcock & Wilcox; water cooler, Lancashire Water Cooler Co.; balancing plant, Crompton & Co.; high- and low-tension switchgear, Edison & Swan United Electric Light Co.; high- and low-tension switchgear for sub-stations, British Westinghouse Co.; cable, British Insulated & Helsby Cables, Johnson & Phillips, Connolly Bros., Chas. Macintosh & Co., and Electrical Engineering & Equipment Co.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £65 15s. to £66 5s. (Last week, £66 10s. to £67.)

**Lantern Slides.**—Berry, Skinner & Co. (78 Upper Thames Street, E.C.) have prepared a series of lantern slides of their well-known switchgear, which they will be pleased to lend to engineers or lecturers.

**Removal.**—On and after the 7th inst. all communications to the Benjamin Electric, Ltd., should be sent to 1A Rosebery Avenue, E.C., where in future the Sales Office will be established. The new telephone number will be Holborn 1830.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.



## LOCAL NOTES

**Bognor: Gas Co. and Electricity.**—The Bognor Gas Co., which is now running its electric lighting department, reports a small loss of £185 10s. on the electrical undertaking for the first half year's working. At the meeting last week, however, the Chairman stated that the demand for electricity supply is gradually increasing, and that it was hoped before long that the Company would have just as big a success with electric cooking as it had hitherto with gas.

**Brentford: Gas Co. and Electric Supply.**—The Brentford Gas Co.'s Bill, which proposes to take powers to apply for electric lighting provisional orders, and also to take transfers of existing orders, has been before a House of Lords Committee, presided over by Lord Hylton, for the past week. There is considerable opposition to the electricity proposals, the opponents including the Metropolitan Electric Supply Co., the Hammersmith Borough Council, and the Barnes and Staines Councils. The point of the opposition, of course, is a possible competition with the existing electric lighting undertakings, whilst in the case of one or two councils whose districts are supplied with electricity by companies, their fear is that the Gas Co. may buy up the small local electric supply company, with detrimental effects upon the consumers of electricity in the matter of price, owing to the absence of competition. For the Gas Co. it has been pointed out that the Bill only gives power to apply to the Board of Trade for provisional orders, or for sanction to any transfers, and that at the usual inquiry held by the Board of Trade in any particular case, local authorities and all interested parties would be heard. In addition, it has been stated that the Gas Co. has no intention of asking for competing powers with any existing authority, and it is not improbable that some limiting words of this description will be embodied in the Bill, although at the moment of going to press the proceedings were some way from being finished.

**Darlington: Power Supply.**—The Borough Electrical Engineer has received an inquiry for a large supply of electricity from the North Eastern Railway Co. for power purposes.

**Dudley: Sale of Electricity Undertaking.**—Reference was made to the disposal of the electricity undertaking to a private company at the last meeting of the Council. It was pointed out that the company has to discharge the whole of the loans and interest upon them, to pay a further sum of £10,500, of which £3,500 is to be paid down, and the balance in seventeen instalments of £550, in addition to a sum of £3,334 unauthorised capital expenditure by the Council.

**Malvern: Bulk Supply.**—The Worcester Corporation recently placed a proposal before the Council, offering a supply of electricity in bulk in preference to the Malvern Council extending its power station, but the Electricity Committee states that it cannot entertain the proposal. The suggestion was for a twenty years' contract. After some discussion at the last meeting of the Council it was decided to adjourn the consideration of the matter for a month, and in the meantime to furnish the Council with copies of the offer from Worcester, and of the report from the Council's own Electrical Engineer on the proposed addition to the power station of a 150-kw. generating set at an estimated cost of £1,500.

**Manchester: New Power Station.**—The Electricity Committee has been unable to come to terms with the Manchester Ship Canal Co. with regard to the abstraction of water for condensing purposes at the new power station which it is proposed to erect on the Canal. A number of offers were made to the Canal Authorities which practically placed the whole control of the supply to be taken in their own hands, but no agreement could be arrived at, and presumably the Canal Co. will oppose the Bill which deals with this matter when it comes before Parliament.

**Swansea: Electricity Profits and Rates.**—In further reference to our note on page 124 of our issue for February 26th, the Electric Lighting Committee has recommended by four votes to three that no allocation to relief of rates should be made from the electricity profits from last year. The Electrical Engineer is opposed to any allocation, in view of large prospective capital expenditure upon the undertaking.

**Yorkshire: Power Co.'s Bill.**—The Yorkshire Electric Power Co.'s Bill, which proposed to take powers to supply electricity

in detail in all districts in its area where there is at present no supply of electricity given, and no statutory supply authority, has been rejected on standing orders on the ground that the Bill did not sufficiently describe the district in which the proposed supply was to be given. The Parliamentary notices regarding the Bill merely referred to the Company's area as a whole, and did not specify the particular districts in which such detailed supply would have been given. The Bill, therefore, cannot proceed this session.

## APPOINTMENTS AND PERSONAL NOTES

Mr. E. P. Barfield has resigned his position as Commercial Manager to the Edison & Swan United Electric Light Co.

Mr. W. J. Larke, Manager of the Power and Mining Department of the British Thomson-Houston Co. at Rugby, has been appointed to the Engineering and Manufacturing Departments to assist the Chief Engineer at Rugby.

The Marquis of Winchester (Chairman of the Victoria Falls & Transvaal Power Co.) and Sir D. Salomons, Bart., have been added to the Board of the City of London Electric Lighting Co. In financial circles these appointments are regarded with some significance in relation to the London Electric Supply Bill.

The Halifax Electricity Committee recommends that the salary of Mr. W. M. Rogerson, the Borough Electrical Engineer, should be increased from £600 to £700 per annum.

Mr. A. S. Barnard, Borough Electrical Engineer at Walsall, has resigned. A successor is to be advertised for at a salary of £500 per annum.

Mr. Edward C. Wallwork, who has been employed for some years at the Ashton Electricity Works, has been appointed assistant contract engineer to Callender's Cable & Construction Co.

Mr. Thomas R. Martin has resigned the position he has held for the past six years with the Metallic Seamless Tube Co., Ltd., and on the 30th inst. will join Messrs. J. H. Tucker & Co., of King's Road, Hay Mills, Birmingham, as their Sales Manager.

Mr. A. T. Young, who has hitherto been Manager of the London office of the British Electric Plant Co., Ltd. (78 St. Vincent Street, Glasgow), has been appointed General Manager.

Owing to the adoption of the forty-eight hour week at the Gillingham generating station, an additional Charge Engineer and Driver are required.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**W. T. Henley's Telegraph Works Co.**—The report and accounts given in our issue for February 19th were adopted at the meeting on Friday. The past year was recorded by the Managing Director (Mr. George Sutton) as the best which the Company had had, and records the number of orders, the quantity of material turned out, and the amount of sales. Satisfaction was expressed with the home trade, but the remarkable feature of the year had been the growth of the foreign trade, which had increased by leaps and bounds, with the exception of the submarine cable department. The Company was getting a fair share of the cable work in connection with the Post Office telephone extensions, whilst in the electric lighting department special attention was drawn to a large contract from the Shanghai Corporation, which, until recently, had bought its electrical materials elsewhere. The whole of the cables for the Central Argentine Railway Co. have now been delivered, and are in process of being laid. Another order of a similar character had come in from the Buenos Ayres Western Railway Co. of some £200,000 value.

**British Electric Transformer Co.**—The shareholders were congratulated at the meeting last week upon the fact that for the third year in succession a 10 per cent. dividend has been recommended. The satisfaction to be derived from this is announced by the fact that less than one half of the total profits are being distributed, and that considerable sums are being placed to reserves. The year 1914 has begun with an amount of orders far in excess of any previous year.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 377 [VOL. X., No. 12]  
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THURSDAY, MARCH 19, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

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OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

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Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KELOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE second reading of the London Electric Supply Bill is deferred until the end of the month. The scheme has been referred to in the Chairmen's speeches at several meetings of the London electric supply companies. (Page 156.)

MR. GEORGE WESTINGHOUSE died in America last week. (Page 157.)

THE "Cascade" induction motor has been developed so that three efficient speeds are possible with a simple type of winding. The motor has valuable inching qualities, and, besides being used for lifts, &c., has been used in two recent winding installations. (Page 157.)

WE give some particulars of the paralleling arrangements for the three large generating stations of the Commonwealth Edison Co. in Chicago. Reactors with a total reactive drop of 20 per cent. at their rated full load of 10,000 kw. are used. (Page 157.)

SOME interesting speeches were heard at the General Electric Co.'s 22nd Annual Dinner on Saturday. (Page 158.)

MR. H. E. O'BRIEN, in his Paper at last Thursday's meeting of the Institution of Electrical Engineers, considered how expenses might be saved by the use of lightened rolling stock on electric railways.—The

construction of a tramway sub-station is suggested in Manchester. (Page 158.)

A FINAL distribution of the assets of the National Telephone Co. is being made.—It is reported that the Nauven wireless station has communicated over a distance of 6,000 miles, and that successful experiments in wireless telephony have been made by Mr. Marconi. (Page 159.)

OUR "Electrical Engineering Literary Section" contains a list of new publications, reviews a number of technical books, and gives a selected list of recommended works on all branches of electrical engineering. (Page 167.)

THE reasons for the interlocking of the charge and discharge battery regulating switches in small lighting plants are discussed in our Questions and Answers columns. (Page 165.)

THE I.M.E.A. has agreed with the B.E.A.M.A. that at least three weeks should be allowed for the preparation of tenders for turbine plant. (Page 165.)

LAST week three Specifications describing details of Mr. E. Kilburn Scott's furnace for the fixation of nitrogen were published by the Patent Office. Others embraced incandescent lamps and wireless telegraphy. A Patent by Mr. Marconi, also relating to wireless, will expire during the week after a full life, as does another Patent by Mr. Wright and the Reason Manufacturing Co. for electrolytic mercury meters. Opposition to the grant of a patent to Mr. C. Trenzen for a process of obtaining ductile tungsten has been entered. We give also the results of other opposition cases in our "Patent Record." (Page 166.)

A NEW design of switchboard with front connections is illustrated in our "Trade Section," which also contains descriptions of a half-watt lamp fitting, an interlocked switch plug, some new cooking appliances, and accessories for conduit wiring. (Pages 167 to 170.)

TURBO-GENERATORS and rotary converters are required at Devonport; rotary converters are also required at Warrington; and cable at Southampton.—Local Government Board inquiries are to be held at Bacup (£1,000); Dublin (£77,000); and Virginia (Co. Cavan), £31,000. (Page 171.)

THERE is a strike at the glassworks at Lemington, at which the bulbs for Osram lamps are blown. The cause is the recent introduction of machines for opening and closing the moulds, by which some unskilled boy labour is displaced. (Page 171.)

THE Bill of the Brentford Gas Co. asking for powers to apply for electric lighting orders has been passed by the House of Lords Committee.—The Leeds Council has negatived a proposal of the Tramways Committee to purchase an electric car as an advertisement of electricity.—An unlimited supply of electricity at 6d. per week is to be given at Dover to workmen's dwellings.—Half-watt lamps are to be installed experimentally for street lighting in St. Pancras. (Page 172.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, MARCH 19TH.

*Institution of Electrical Engineers.*

8 p.m. Discussion on Electric Battery Vehicles to be opened by F. Ayton.

FRIDAY, MARCH 20TH.

*Electro Harmonic Society.*

8 p.m. Last Smoking Concert of the Season. Holborn Restaurant.

SATURDAY, MARCH 21ST.

*Royal Institution.*

3 p.m. Afternoon Lecture IV.: "Recent Discoveries in Physical Science," by Prof. Sir J. J. Thomson, F.R.S.

TUESDAY, MARCH 24TH.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. At 207 Bath Street, Glasgow. Discussion on Electric Battery Vehicles to be opened by A. Page.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. At the University, Liverpool. "Experiments on the Blast Cooling of Transformers," by F. J. Teagó.

*Institution of Civil Engineers.*

8 p.m. "Comparative Economics of Tramways and Rail-less Electric Traction," by T. G. Gribble.

WEDNESDAY, MARCH 25TH.

*Electrical Trades' Benevolent Institution.*

2.30 p.m. Annual Festival Dinner at Trocadero Restaurant.

THURSDAY, MARCH 26TH.

*Institution of Electrical Engineers.*

8 p.m. "Current-limiting Reactances on Large Power Systems," by K. M. Faye-Hansen and J. S. Peck.

**The London Electrical Engineers.**

Headquarters (46 Regency Street, S.W.) open Saturdays till noon.

*Rating Exam.* for all Cos. from 7 to 10 p.m. every Wednesday.

(TO-DAY) THURSDAY, MARCH 19TH, C. Co. FRIDAY, MARCH 20TH, D. Co. MONDAY, MARCH 23RD, A. Co. TUESDAY, MARCH 24TH, B. Co., Tech. Inst., 7 to 10 p.m. Min. Range Practice, 7 to 9 p.m.

WEDNESDAY, MARCH 25TH.—Recruits Infantry Drill, 7 to 8 p.m. Tech. Inst., 8 to 10 p.m.

**Finsbury Technical College O.S.A. Smoking Concert.**—A varied programme of both instrumental and vocal music has been arranged for the eighth annual smoking concert of the Finsbury Technical College Old Students' Association, to be held at the Waldorf Hotel on Friday, March 27th. Mr. Sydney A. Smith (66 Elystan Street, Chelsea, S.W.) intimates that he will be pleased to supply tickets, which must be obtained before the evening of the concert, at 1s. each.

## LONDON ELECTRIC SUPPLY

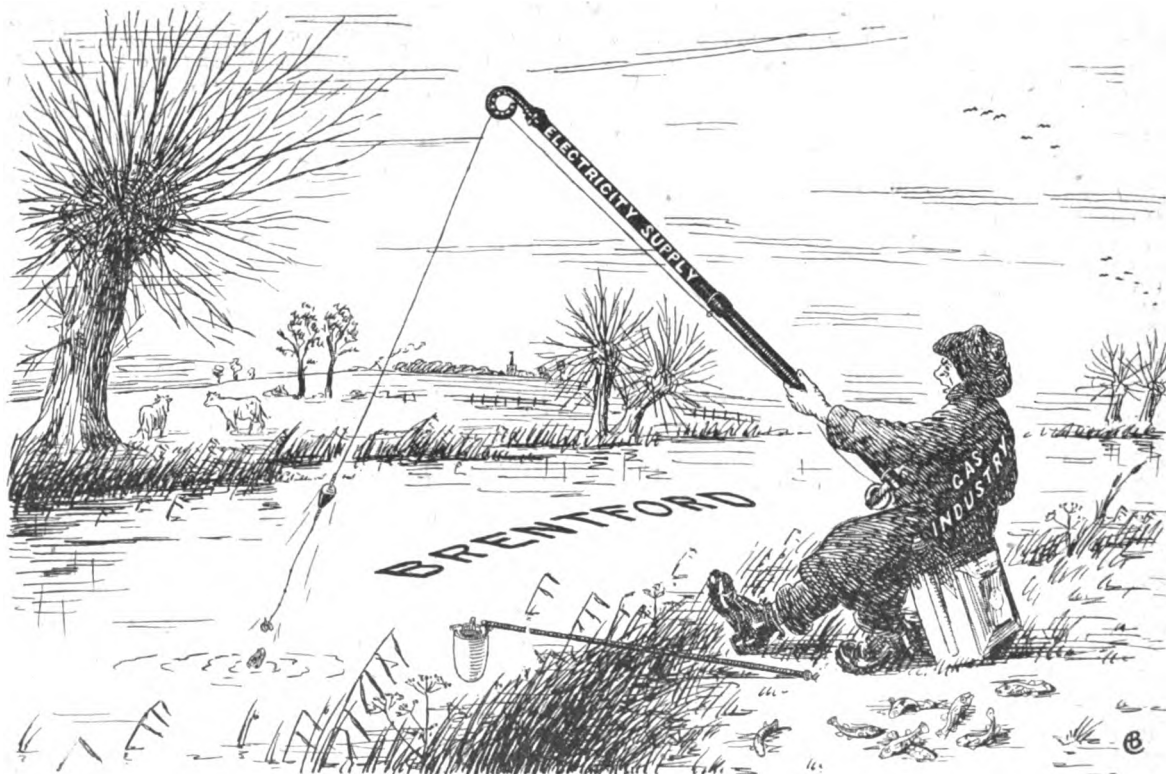
AT the annual meeting of the County of London Electric Supply Co., on Monday, on the motion of a shareholder, a resolution was passed adopting the scheme for dealing with London electric supply put forward by the bankers, Messrs. J. Henry Schroder & Co., Messrs. Morgan Grenfell & Co., and Messrs. W. Greenwell & Co. The Chairman, Mr. J. B. Braithwaite, explained the circumstances which had led up to the promotion of the Bill, and explained the Company's attitude towards the L.C.C. The financial details of the scheme were briefly as follows:—The existing preference shares to be exchanged on a 4½ per cent. basis for 5 per cent. debentures in the new Company, with a sinking fund behind them. The existing ordinary shares to be exchanged on a 5 per cent. basis for 6 per cent. preference shares, and, in addition, to receive a bonus of from 30 per cent. to 50 per cent. in ordinary shares of the new Company; for example, £10 ordinary shares receiving at present 10 per cent. dividend would receive in exchange £20 in 6 per cent. preference shares of the new Company, plus a bonus of £6 to £10 in ordinary shares. It was said that there would be an immediate increase of over 11 per cent. in the dividend on the existing preference shares, and 20 per cent. in the dividend on the existing ordinary shares, and, in addition, dividends on the new ordinary shares; and that the scheme provided compensation to directors and officials displaced.

The engineering side of the scheme had been in the hands of Dr. H. F. Parshall, who estimated that for the unification of London's electric supply on the lines contemplated £4,000,000 would ultimately be required, but it would be extended over a series of years. He regretted that the chairmen of the other companies, with three or four exceptions, did not seem to consider the scheme worth serious consideration.

Mr. Braithwaite also spoke on the scheme at some length at the meeting of the City of London Electric Lighting Co. last week, and expressed his regret that a majority of his colleagues on the board of that company had insisted on petitioning against the Bill.

The matter was referred to by Mr. H. R. Beeton at the meeting of the Brompton & Kensington Co., who said that the scheme had met with emphatic rejection by the directors, partly on the ground that the proposed amalgamation was on the basis of dividends and not on total profits. He further stated that the Joint Committee representing the London Companies were engaged upon the formulation of a unification scheme on co-operative lines, which should be more economical, and should be entitled to more favourable consideration by the L.C.C. Mr. W. R. Davies made a similar statement at the meeting of the Chelsea Electricity Supply Co.

The second reading of the London Electricity Supply Bill has been still further postponed until Monday, March 30th.



Another bite at last, but they are rather small fry. (See page 172.)

## OBITUARY

GEORGE WESTINGHOUSE.

**M**R. GEORGE WESTINGHOUSE, whose name is a household word in both electrical and railway circles, died on Thursday last in New York, at the age of sixty-seven. Although his presidency of the Westinghouse Electric & Manufacturing Co. terminated in 1910, there were many other branches of the undertakings connected with his name in which he played an active part to the end. There is no need to refer to the magnitude of the electrical and other businesses which he originated, for they are known all over the world. His name is even better known in connection with the compressed air brake, of which he was himself the inventor, and many stories are told of the initial difficulties which, like many inventors, he had to encounter before it could be introduced with success, although there have been few inventors whose ultimate success was so complete. It was in 1868 that he worked out the first applications of compressed air to railway brakes, patented in the following year, which also saw the foundations of the Westinghouse Air Brake Co. He was educated at the Union College, Schenectady, and had served in the United States Navy, and fought in the War of Secession as a volunteer. The son of a maker of agricultural machinery, of Schenectady, he was born at Central Bridge, Schoharie Country, N.Y., in 1846.

## THE "CASCADE" INDUCTION MOTOR

**T**HE development of the "Cascade" induction motor was treated of in a Paper by Mr. L. J. Hunt, read before the Manchester Section of the Institution of Electrical Engineers at a recent meeting. The cascade motor is essentially a low-speed machine, and it is when designed for speeds which are abnormal for single-field motors that it shows to best advantage. The numbers of poles for which the machine can be constructed are determined by the following conditions: The windings in the two fields must be mutually non-inductive, and when super-imposed must not produce an unbalanced radial pull on the rotor. These conditions are satisfied if the numbers of poles are in the ratio of 2:1. A single winding has been evolved satisfying these conditions. The rotor has to be provided with main and auxiliary windings, and the best results have been obtained when the numbers of turns on these are in the ratio of 1.73 to 1.00. The two windings are inter-connected, but no slip-rings are necessary for a one-speed machine. The one-speed motor closely resembles a machine of ordinary construction. The stator windings are identical in appearance, and only differ in the cross-connections of the coils. Standard construction is also used for the rotor. The stator winding does not allow of the production of any except the main field, unless the windings are acted upon by a field having a number of poles differing from those of the main field. Therefore, if a slip-ring rotor having the same number of poles as the stator be inserted in place of its own rotor, the machine will run as an ordinary one-field motor, but at a speed 50 per cent. in excess of that at which it will run with its own rotor. The iron loss will be less, and the copper losses slightly more than in a standard motor. A single rotor winding of the barrel type has been evolved, and any rotor of this type can be made to give an extra cascade speed by changing its cross-connections. Owing to the magnetising currents in the rotor windings, the cascade power-factor is high, and not, as is generally believed, low.

The pull-out torque of a two-speed motor is approximately the same at both speeds, but for fan driving and other cases where a smaller torque is required at the second speed, a switch may be provided, so that the stator windings may be in mesh at the higher, and at star at the lower, speed. This allows a smaller motor to be used, and keeps the power-factor high at both speeds. The single-speed cascade motor is useful for foundry cranes on account of its inching qualities, but two-speed motors are used for the longitudinal motion of travelling cranes in long shops. The application of these motors to the driving of winding engines and rolling mills is a development of recent date, and the results obtained at two installations in South Africa should be interesting, as there are two speeds at which rheostatic losses are absent. For a two-speed motor giving speeds in the ratio of 3:2, the efficiency during acceleration (constant torque) should be about 64 per cent., and with a one-speed machine about 50 per cent. An additional efficient running speed, in the ratio of 3:1, can, if necessary, be provided for by halving the number of main poles. Electric braking can then be obtained down to one-third full speed. The provision of this speed is

also useful on motors for lifts, &c. Experiments are being made with a view to developing a self-starting synchronous motor from the cascade motor by substituting direct-current for the induced stator currents, and starting the machine as an induction motor by resistances connected to the slip-rings. It is possible, also, that, by coupling a change-pole type of squirrel-cage motor in cascade with a two- or three-speed machine, a large number of speeds may be obtained.

## PARALLEL WORKING OF THE CHICAGO GENERATING STATIONS

**I**N order to ensure that the three large generating stations of the Commonwealth Edison Co. in Chicago shall have similar load curves and proportional outputs, the entire load is divided among them in accordance with a certain schedule from a central control station known as the load dispatcher's office. The load consists of a railway and a private and an industrial lighting and power load. Both D.C. and 60-cycle A.C. is supplied. By plotting the total demand against time it has been found that the total load exceeds three-fourths of its maximum value for but 150 hours during the year, while the energy output at about three-quarter load is only 0.3 of the total. During the last four years the load has exceeded half the maximum for less than 200 hours each year, and one-quarter of the maximum for about 5,300 hours. As the load is now quite diversified, no great change, according to the *Electrical World* (New York), is expected in future years. The peak load is now about 233,000 kw. The three generating stations are known as Fisk Street, Quarry Street and Northwest. The Quarry Street station feeds normally about 2,000 kw. into Fisk Street, while another 2,000 kw. is carried by the Northwest station, which connects with Fisk Street by lines, in the middle of which the sub-station load is tapped off. In addition, the Northwest station feeds other substations over direct lines. Between the hours of 5 and 6.30 p.m. only the Northwest station, according to schedule, feeds 4,000 kw. into Fisk Street. In case of trouble at one station or another, the load dispatcher issues instructions to the other stations to depart from schedule and to carry such additional load as conditions may require. Paralleling is done over system reactors at Fisk Street, having a total reactive drop of 20 per cent. at their rated full load of 10,000 kw. Normally the Fisk Street and Quarry Street stations are operated as an open ring, with the Quarry Street plant in the centre and the halves of Fisk Street at each end. The Northwest station is tied in with one of the two parts of Fisk Street, but without system reactors. However, when the number of units in operation at Fisk Street is seven or less, the open ring is closed at Fisk Street and opened when the number of units exceeds seven.

To prevent the reactors being short-circuited by section feeders for the various sections being brought together in a sub-station, coloured pegs are used to indicate on the load dispatcher's board the extent of each section. Red plugs are used wherever the lines from any two sections may be connected together after load conditions over the reactance are adjusted. If it is necessary to connect together two lines from the two sections of Fisk Street, the load dispatcher orders the load on both of the Fisk-Quarry tie-lines reduced to zero, or else orders the load equalised in the same direction. If switching is necessary between a line from Quarry Street and a line from either section of Fisk Street, the load on the tie-line connecting the Fisk Street section in question with Quarry Street must first be reduced to zero. After the necessary switching has been performed, schedule operation of the different generating stations is again resumed on order from the load dispatcher. When switching is to be done between two lines, the load dispatcher first obtains a reading of the lines' instruments. He then gives the order to connect the lines in question together. Except in very rare cases a change in load is observable, and this serves as a check that the order has been properly executed. The two lines are then separated at some other point, thereby completing the desired transfer of load from one line to another. If a load change on the two lines in question is not observed, it is an indication that the two lines have not been tied together, owing perhaps to some link being left out. This can be readily discovered on a check up.

Ordinarily the bulk of the high-pressure switching is done at night, but much also has to be done during the day owing to repairs, alterations, &c., as well as that due to the schedule. In this connection an elaborate protective system is used.



## THE GENERAL ELECTRIC DINNER

AT the twenty-second Annual Dinner of the General Electric Co., Ltd., last Saturday, at which about 700 were present, the Chairman, Mr. Hugo Hirst, delivered a most interesting speech. During the past two years, he said, the Company had shared in the wave of general prosperity; they had extended their works, added to their staff and workmen, and had been successful in raising their standard of value as well as their standard of living. A considerable sum had just been voted for the erection of very large club buildings, both for the work-people and staff. The Company had gone ahead considerably in the acquisition of rights to supply whole cities with light and power. They had also started, in conjunction with friends, cable works in Southampton, and were now, he believed, the only firm within the British Empire to manufacture "everything electrical." In continuation of the work of establishing themselves in the British Dominions overseas, a company had been established in Toronto, and 60 or 70 young men had been sent out there to preach the gospel of the three letters, G.E.C. The new London offices in Kingsway, which would be on a site of 26,000 sq. ft., and were being built as high as the L.C.C. would permit, were being designed with future requirements well in view, as the lease of the site was for 99 years; he could not prophesy any date for completion, as the present building strike might cause delay. The necessity of looking forward so many years induced Mr. Hirst to interesting speculations as to what the world would be like in twenty or thirty years' time, and also to the reflection that without electricity there would be no ideals of Empire. The telegraph, said Mr. Hirst, kept our thoughts, lives, emotions, and ideals running in parallel, and kept warm the feeling of kinship between successive generations. There would have been no 4th of July, 1776, with the meaning attached thereto, if there had then been a cable across the Atlantic. When telegraphy to the Colonies could be cheaper, when India and Australia were brought nearer to the Mother Country by an overland route to India, and communication all over the Empire accelerated and facilitated, one might arrive at the ideal of one Common Law, one Patent Law, one Trade Marks Act, and uniform coinage, weights, and measures throughout the whole Empire. Mr. Hirst concluded by proposing the toast of "Electrical Industries within the Empire."

Mr. L. S. Amery, M.P., who was the next speaker, wished that a better means could be found to discuss in Parliament matters affecting science and industry, and suggested that there should occasionally be a session in which matters should only be passed by a two-thirds majority.

The Hon. Sir John McCall, Agent-General for Tasmania, who also replied to the toast, said that in listening to Mr. Hirst he felt he was listening to a master of industry. He referred to the special facilities in Tasmania for developing the electrical industry. Launceston, he said, is the best-lighted city in the Southern Hemisphere, and even towns with a population under 2,000 had electric light. They were "harnessing" the power of the elevated lakes system, and Tasmania might eventually be one of the most important manufacturing states of the Australian Commonwealth. In this connection he referred to the Mount Lyell power scheme (see ELECTRICAL ENGINEERING of August 7th, 1913, p. 454). Mentioning more particularly the General Electric Co., he said that he was informed that over 10,000 hands were employed, and he congratulated the Company on paying regular dividends. If other firms were not so successful as this, the success of the G.E.Co., he said, was obviously due to the management and to the care of the employees. If the Company's policy were followed by everybody in this latter respect, there ought to be an end of labour unrest. The Company's carbon factory was of national importance, as without it we should have to buy carbons for our searchlights from abroad—and conceivably be dependent on a country with whom we might be at variance. He thought that the Company was doing a service to the Empire in establishing the subsidiary Companies in various parts of the Empire and supplying them with their products at manufacturing cost. Tasmania, he concluded, should be an example to other parts of the Empire, for he had instructions, when inviting tenders, to do so in all cases within the Empire.

Mr. M. J. Railing was the next speaker. In the course of his speech he attributed the migrating instinct of the sons of Great Britain not to a roving spirit, a love of adventure, the lure of the sea, or an ambition to accumulate wealth and land, but to the longing to "get on," to succeed, and to be leaders; it should, he said, be the object of every big undertaking such as theirs to perpetuate this longing.

Other speakers were Mr. W. Duddell, F.R.S. (President of the Institution of Electrical Engineers), Dr. Alexander Russell, Mr. L. G. Byng, the Hon. J. G. Jenkins, Mr. E. Manville, and Mr. A. J. Walter, K.C.

**The Electrical Trades' Benevolent Institution.**—We are requested to state that the Vice-Presidents at the annual festival dinner of the Institution, on Wednesday, March 25th, will be Mr. C. H. Wordingham, and Mr. Faithfull Begg.

## ELECTRIC TRACTION NOTES

Mr. H. E. O'Brien, in his Paper, at the Institution of Electrical Engineers last Thursday, on the Design of Rolling-Stock for Electric Railways, showed how important an influence on power consumption and other sources of expense was produced by the weight of the rolling-stock, especially where the acceleration was frequent and severe. In the case of multiple-unit coaches he put the saving in annual costs for each ton by which the weight was reduced at £12 5s. for current, £5 for rolling-stock repairs, and £1 for track repairs, or £18 5s. in all for motor-coaches and £14 5s. for trailers; or, taking into account interest and depreciation, £25 5 and £19 respectively, on the assumption that these things were proportional to the weight, it therefore paid to spend as much as £185 per motor-coach and £145 per trailer. In dealing with the various ways in which the weight might be kept down, he emphasised that the coaches should be made as wide as possible for best economy of weight in relation to seating capacity. Lightening the body-work permitted of lighter underframes, bogies, and motors. With regard to the roof, the elliptical design was lighter than the clerestory type, as well as being conducive to better lighting. The use of aluminium roof covering and panels could effect a saving of nearly half a ton per car over steel. Fixed seats were lighter than throw-over seats, and with regard to the floor, corrugated aluminium plates fitted in with a cork composition could be used. Nearly a ton could be saved by the use of the new high-tensile steels for underframes, and it was important that the weight of the control and other apparatus fixed to the frame should be evenly distributed. Lighter forms of brake pumps were now being introduced. On English roads the heavy equalising type of bogie was unnecessary. In his opinion the springs should be placed inside the frames, even at the cost of a little weight; but nearly 0.75 ton per coach could be saved by adopting spiral instead of elliptical bolster springs. Single brake-block equipment was in itself lighter than the double-block arrangement, but the strengthening of other parts entailed defeated this object. Motors were now ventilated instead of totally enclosed, and the lightness obtained by high motor speed was an economy in the end, even though it entailed higher cost of gear maintenance. Illustrations were given of details of coaches used on the Lancashire & Yorkshire Railway, and on the subject of heating, it was stated that the increase of load due to car heating could amount to 9 per cent.

The prevailing opinion expressed in the discussion was that Mr. O'Brien had over-estimated the saving in maintenance and other expenses, due to lightening of weight, and Mr. J. B. Sparks in particular pointed out that it was illogical to expect the maintenance cost to vary directly as the weight, but Mr. O'Brien announced that his assumption was based on experience on the Lancashire and Yorkshire Railway. Mr. Casson, of the District Railway, however, quoted cases of light rolling stock in London costing much more to maintain than heavier designs, and other makers agreed that a heavy coach was often cheaper to maintain than a lighter one. Again, as Mr. Mason (L. & N.W.R.) pointed out the advantages of lightness were often less than those obtained by the increased steadiness of running of a heavy vehicle. Mr. Bowden (Metropolitan Railway), however, reminded the meeting that it was mainly by the use of stronger material that Mr. O'Brien proposed to effect his lightening. Speaking more generally of bogie design, Mr. Burnett, who was steam locomotive superintendent to the Metropolitan Railway, said that motor bogies were not built sufficiently on locomotive lines, and he advocated longer wheel bases, larger wheels, and would like to see, if possible, the motors mounted on the underframes. Other speakers agreed that the tractive function of the motor bogie was often not sufficient, taken into account as to its design. There was also some discussion, in which Mr. H. W. Firth (G.E.R.) joined, on the relative merits of compartment and corridor cars, and the space to be allowed for seats, and criticisms and corrections of the author's curves were made by Mr. Casson, Mr. Carter, and others. Dr. S. P. Smith took the opportunity to put in a plea for field control of traction motors, which he said was facilitated by the use of interpoles.

In the course of a recent lecture on electric traction given in the large hall of London Bridge Station, Mr. P. Dawson (Consulting Electrical Engineer to the L.B. & S.C. Rly.) said that so far as the electrification of main-line railways was concerned, equal progress had been made in Europe and in America. About 2,000 miles of single track had been electrified in each case. He regarded as the most important electrification scheme so far carried out the New York, New Haven, and Hartford Railway.

The electrification of the Usui-Toge mountain railway (Japan) has been attended with most successful results, and is interesting on account of the use of direct-current at 650 volts, except at stations, where overhead contact lines with single catenary suspension are used. According to the *A.E.G. Journal*, the line, which is only about  $6\frac{1}{2}$  miles long and connects Karuizawa and Yokogawa, was constructed in 1893 as a single-gauge adhesion and steep-gradient line, with the Abt rack system. The adhesion sections have maximum gradients of 1 in 40, and the rack sections are throughout constructed on a gradient of 1 in 15. The through-trains between the east and west coasts of the island were hauled over this section by three-axle rack locomotives. The gauge is the Japanese standard of 3 ft. 6 in. One steam locomotive could manage up to six coaches. There are twenty-six tunnels on the route, and these comprise about 23 per cent. of the total length of the line. The work of electrification was started in 1910, and the twelve D.C. locomotives supplied by the A.E.G. were running in May, 1912. The journey time has been reduced from ninety to forty minutes. Energy is delivered from a generating station at Yokogawa, where three vertical 1,000-kw. Curtis turbines are installed. These drive 6,600 volt three-phase 60-cycle alternators, excited at 125 volts by two 75-kw. exciters. The 6,600-volt supply is taken to two substations through underground armoured cable, where it is transformed to 240 volts and then converted to 650 volts D.C. by four 450-kw. rotary-converters. A buffer battery consisting of 812 cells, having a capacity of 1,322 ampere-hours, in connection with a 100-kw. Pirani booster. The reason for the adoption of 650 volts D.C. as the traction current was that the tunnels would not admit of high-pressure overhead lines and at 650 volts it was just possible to secure satisfactory insulation. The current necessary made the use of a third rail imperative on the rack section. On the side tracks at the stations, however, a 100 sq. mm. overhead line is used. Current is collected from this through a trolley wheel. The line is fed by four insulated cables from each converter station fixed to wooden masts in the open and in insulators in the tunnels. The current is returned through the rails and negative feeders.

Some notes on the earlier electrical troubles experienced on the 11,000-volt single-phase equipment of the New York, Westchester & Boston Railway are given in the *Electric Railway Journal* (New York). Among the more important may be mentioned several cases of the main transformers, situated under the motor-cars, burning out. This was found to be due to too much air being circulated by the ventilating fans, with the result that on damp days moisture was drawn in, and, as the transformers ran too cool, the insulation was spoilt. The trouble has been overcome by fitting baffle-plates between the fans and transformers, with openings in the bottom of the casings so that water can be drained out. The speed of the fans was also reduced. Trouble was also experienced owing to the repulsive action between the cables connecting the transformers with the switches, as these were not sufficiently well anchored. Owing to surges, it has been necessary to fuse all the circuits much higher than was originally done. The main high-pressure circuit-breakers are set to open at 200 amperes, although the normal starting current is 65 amperes. The motors and auto-transformers were earthed to the underframe of the car, but the current dealt with was too big. On new cars the earth cable from the motors is to be taken to the auto-transformer winding. One case of the high-pressure cables earthing to the conduit has occurred. Earths have occurred by birds alighting on the roof, while the pantograph was held down by a low contact line at a bridge. No trouble has been experienced with the motors. It was found necessary to turn and slot the commutators about once a year, or after running 50,000 miles. Four armatures have burnt out: three due to overwork and excessive external heat and one due to an earthed commutator bar. Test made on six cars after they had been in service for five hours with the outside air at 24° C., showed average temperatures of 69° C. for the armatures, 55° C. for the fields, 82° C. for the commutators, 39° C. for the motor casing, and 49° C. for the transformer core. The switch contacts have been found to last about one year. Owing to the intermittent torque it has been found necessary to heat the motor pinions to 800° F., and then to hammer them lightly in place. As both motors were connected permanently in parallel, it was found that the cars could not be pushed in the yards by shunting locomotives at speeds above 4 m.p.h. A separate switch for each motor is to be installed in the control circuit instead of the present arrangement of one, which controls both motors at the same time.

It is anticipated by a correspondent in the *Manchester*

*Guardian* that the forthcoming report by Mr. McElroy (General Manager, Manchester Tramways) on the congestion of traffic in Manchester will probably suggest that a tramway subway, just under the roadway, be built in the central part of the city. The subway would run between the rivers Irwell and Medlock via Blackfriars Street, Market Street, Piccadilly, and London Road. This would diminish the present delays at the Deansgate, Cross Street, High Street, Mosley Street, and other crossings.

The Hove Corporation has now decided that, until the overrunning system of trolley omnibuses has been tried by the Brighton Corporation, it cannot see its way to agree to arbitration. In reply, the Brighton Corporation has pointed out the underrunning system, as adopted by itself, is the only one suitable for the authorised through-routes between Brighton and Hove, owing to the necessity of crossing several tramway tracks. As stated in our last issue, the Brighton authorities wish for an arbitrator to determine what system be adopted.

Ozonising apparatus is being installed in connection with the ventilation of the Charing Cross, Euston & Hampstead, and the Baker Street & Waterloo Tube Railways, at Edgware Road, Euston, Goodge Street, and Charing Cross.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The liquidator of the National Telephone Co., Mr. G. Franklin, has announced that the final distribution of assets, amounting to 148 per cent., or 8½d. in the £, will be made on Wednesday next. The total distribution on the deferred stock is thus brought up to 105·48 per cent. The debenture stocks, first, second, and third preference shares, were paid off at par, and the preferred stock at 105 per cent.

The twenty-fifth anniversary of the filing of the first Strowger patent for automatic telephones was on March 12th, says *Telephony* (Chicago). The inventor, Mr. A. B. Strowger, claimed in this American patent the following:—"In a system of telephone, telegraph, or other electrical exchange, the combination with a series of wires leading to different stations in the system, and having their ends insulated and held in a curved row, of a contact needle supported at the axis of the rows, mechanism for moving the needle from row to row, mechanism for moving the needle along the row, magnets for actuating said mechanisms and wires leading from a sub-station for conducting electricity to energise the said magnets."

A short Paper by Mr. W. Judd, describing the Gulstad vibrating relay, has been accepted by the Council of the Institution of Electrical Engineers, and has appeared in the *Journal*. The relay is applicable to double-current Morse signalling, and is largely used by the Great Northern Telegraph Co. of Copenhagen, and by other telegraph companies to a small extent.

It is stated that the wireless station at Nauen has exchanged clear messages with the Windhuk station in German South West Africa, a distance of about 6,000 miles.

It is reported that successful tests have just been made with a new wireless telephone between Italian warships by Mr. Marconi.

Meetings of the creditors and shareholders of the Grindell-Matthews Wireless Telephone Syndicate, Ltd. (in liquidation), were held on March 10th, at which it was stated that reconstruction negotiations were in progress by which it was hoped to pay off in full the debts, which amounted to £6,000. The Syndicate had a station at Letchworth, and one at Northampton, between which satisfactory communication could be maintained.

A profit of £24,166 is reported on the year's working of the Automatic Telephone Manufacturing Co.

The cable between Perim and Djibouti was repaired on March 10th, and the Persian lines were down on the 12th inst. between Borazjoon Ahvaz.—All telegrams to S. Domingo are being sent by wireless via Pence, Puerto Rico.—Owing to storms there was probable delay to France, Switzerland, and Italy, the cable and landlines being down.—

**Threatened Wiremen's Strike.**—A meeting of the Electrical Trades' Union last Thursday discussed until nearly midnight the card of rules issued by the London Electrical Masters' Association (published in our issue of last week), and it was decided to defer any action until after the meeting of the Union representatives with the masters, which is to take place to-day.

## "ELECTRICAL ENGINEERING" LITERARY SECTION

### NEW PUBLICATIONS

- "A Handbook of Wireless Telegraphy," by J. Erskine-Murray. 442 pp. 8½ in. by 5½ in. 208 figures. (London: Crosby Lockwood & Son.) Fifth edition. 10s. 6d. net; abroad, 11s. 2d.
- "Incandescent Electric Lamps and their Application," by D. H. Ogley. 107 pp. 7½ in. by 5 in. 59 figures. (Longmans, Green & Co.) 2s. 6d. net; by post, 2s. 9d.
- "Practical Uses of the Wave Meter in Wireless Telegraphy," by J. O. Mauborgne. 74 pp. 9½ in. by 6 in. 42 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 4s. 2d. net.
- "Handbook of Electrical Methods." Compiled from the *Electrical World*. 25 pp. 9½ in. by 6½ in. 386 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.
- "American Electricians' Handbook," by T. Croft. 711 pp. 7 in. by 4½ in. 792 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.
- "Die Profilgestaltung der Untergrundbahnen." Eine Bautechnisch-Wirtschaftliche Studie. By A. Macholl. 129 pp. 9½ in. by 6½ in. 44 figures. (Munich: R. Oldenbourg.) 4s. 6d. net; by post, 4s. 11d.
- "The Dignity of Business: Thoughts and Theories on Business and Training for Business," by H. E. Morgan. 260 pp. 7½ in. by 5 in. (London: Ewart, Seymour & Co., Ltd.) 2s. 6d. net; by post, 2s. 9d.
- "The Elementary Principles of Illumination and Artificial Lighting," by A. Blok. 248 pp. 7½ in. by 4½ in. 126 figures. (London: Scott, Greenwood & Son.) 3s. 6d. net; abroad, 3s. 10d.
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- "Electrical Engineering Problems." Part. I., Direct-Current Circuits and Apparatus; Part II., Alternating-Current Circuits and Apparatus. By F. C. Caldwell. 105 pp. 9½ in. by 6 in. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 4s. 2d. net.
- "Problems in Alternating-Current Machinery," by W. V. Lyon. 136 pp. 9½ in. by 6 in. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 6s. 3d. net.
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- "The Universal Electrical Directory (J. A. Berly's), 1914." 1550 pp. 9½ in. by 6½ in. (London: H. Alabaster, Gatehouse & Co.) 21s. British and Colonial Sections only, 12s.
- "Answers to Problems in Essentials of Electricity for Wiremen and the Electrical Trades," by W. H. Timble. 11 pp. 7 in. by 4½ in. 2 figures. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 1s. net; by post, 1s. 1d.
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### REVIEWS OF BOOKS

**Die elektrischen Metallfadenglühlampen insbesondere aus Osmium, Tantal, Zirkon und Wolfram. Ihre Herstellung, Berechnung und Prüfung.** By C. H. Weber. 453 pp. 9 in. by 6 in. 216 figures. (Leipzig: Dr. Max Jänecke.) 16s. net; by post in United Kingdom, 16s. 6d.; abroad, 17s.

This book is a development of the author's publication on carbon filaments and carbon filament lamps. It deals exclusively with the manufacture of metallic filament lamps. The author has devoted himself minutely to collecting accurate references, particularly from patent literature, without, however, discriminating between the practicability of the different processes described. Nevertheless, the book will prove useful to the technical student interested in this industry, because it contains a great deal of information regarding some practical processes, which has not been published before. As a compendium for the lampmaker it will form a convenient and useful book of reference of a historical kind, though it gives little help towards proper appreciation of modern commercial developments; in other words, the author appears to accept the statements made in the different patent specifications as giving the true facts as regards the various processes proposed from time to time.

After discussing the early proposals for lamp manufacture, of which the platinum lamp was the only typical commercial lamp of the time, until it was superseded by the lamp having a cheaper filament of carbon, the author gives a great deal of information as regards the osmium lamp, the zircon (carbide) lamp, and the tantalum lamp. Carbon filaments having a coating or addition of metal are then summarised, and finally lamps with filaments of metals, or metal carbides, nitrides, or hydrides, or mixtures of these with the metals, are referred to.

The remaining three-quarters of the book is devoted to the tungsten filament lamp, and admirably illustrated descriptions of the various processes used in the manufacture of the squirted tungsten filament lamps are given, showing the intimate knowledge of the author with actual lamp manufacture. The author states in the preface that the description of the drawn tungsten wire filament lamp, the latest technical achievement, which is now the type most largely used, and the methods for obtaining the drawn tungsten wire, are withheld for a future edition. Meanwhile, Mr. Weber's book, now published, offers so much of interest that the perusal of it can be highly recommended.

**Electro-Thermal Methods of Iron and Steel Production.** By J. B. C. Kershaw. With an Introduction by J. A. Fleming, F.R.S. 239 pp. 9 in. by 5½ in. 92 figures. 50 tables. (London: Constable & Co., Ltd.) 8s. 6d. net; abroad, 9s. 1d.

There is much useful information in this work which distinguishes it from those preceding it. The author collected as much information as was available in 1907 and incorporated it in a handbook published at that date. The great extensions which have taken place since then have been carefully followed, and official information as to the working of all the plants in existence has been obtained, as far as possible, and has been presented so that the actual results, in some cases taken over extended periods, of the different installations are easily comparable. A general sketch of the scientific principles of electric heating is given, together with the broad lines of furnace design in so far as these relate to the smelting or refining of iron and steel. We are pleased to see, however, that the bulk of the space is given over to full descriptions of actual installations and methods of operation. One is able to follow how, of the later designs of furnace, some have survived and some, which have not proved themselves better than their progenitors, have either not entered or else have soon disappeared from the industrial conflict. There are already several steelworks in this country where electric furnaces are used, especially in the manufacture of high-grade tool steel, and the number shows every sign of being on the increase, though there is little likelihood of any radical changes being made in

the methods of pig-iron production for some time to come. Besides the working costs given, lists of the different types of furnaces in use in different parts of the world are included, as well as lists of English and foreign patents relating to electric furnaces for iron and steel production, and relating to each particular type of furnace. The matter is conveniently put together, and should prove useful both to practical steel-makers, students, and experimenters.

**Electrical Engineering.** By C. V. Christie. 417 pp. 9½ in. by 6½ in. 378 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 17s. net.

Mr. C. V. Christie, who is Assistant Professor of Electrical Engineering at the McGill University, Montreal, may be said to have produced a book of considerable value to students of electrical engineering. The range covered is wide, as the subjects include electrostatics, magnetism and electromagnetics, electric circuits, direct-current machinery, all kinds of alternating-current machinery, converters and transmission lines. Although it does not purport to be a treatise on design, the actions taking place in the various parts of the machinery treated are clearly and accurately set forth, while the dependence of one action on another is well illustrated, so that by studying the analytical and graphical methods of dealing with the many problems which arise in this part of a large subject, the reader is enabled to form a concise idea of the correct proportioning of different parts of machinery to obtain the best results. The effect of departures from existing practice in the design and operation of electrical machinery may also be readily gleaned. The space devoted to alternating-current commutator motors is not large, but gives excellent preparatory reading for a study of the more highly specialised books dealing with these motors, as it is sometimes difficult to follow their behaviour from these unless something is previously known of their construction and design. Transformers and induction motors are treated at greater length, while the section on converters, including the mercury rectifier, should prove very useful. The section on transmission lines is devoted chiefly to a mathematical treatment of high pressure lines, but nothing is given which is not of use. A small point may be made of the fact that in a few places, especially in the latter section, the explanations of the symbols used in the equations are not complete; for instance, in one place we read: "where  $D$  is the distance between the conductors and  $R$  is the radius of the conductors." The units are not stated, and cannot be inferred from the particular context. From a theoretical point of view, too, it may be said that the laws of magnetism are given too vaguely, as the influence of the medium in which the magnetic bodies are situated should be introduced right at the beginning. The equivalent problem of the electric field is most ably treated, as is every other part of the book.

**Text-Book of Physics.** By J. H. Poynting, F.R.S., and Sir J. J. Thomson, F.R.S. Electricity and Magnetism: Parts I. and II., Static Electricity and Magnetism. 345 pp. 9½ in. by 6½ in. 246 figures. (London: Charles Griffin & Co., Ltd.) 10s. 6d.; abroad, 11s. 1d.

This is the fourth of a series of volumes by the same authors, forming a complete text-book of physics, and contains Parts I. and II. of the section devoted to electricity and magnetism. Part I. treats of static electricity and Part II. of magnetism, while the phenomena of electric currents, electro-magnetism, and the states of change of electrical systems generally, are reserved for a volume yet to make its appearance. The names of the eminent authors are a sufficient guarantee that the treatment represents up-to-date views, although there is naturally less with regard to which fundamental ideas have changed in the subjects of this volume than there will be in the next. As the authors comfortably put it: "The view of electric action taken by Faraday and largely developed by Maxwell still holds good. . . . The electron theory is, substantially, a more highly developed and dynamical form of Faraday's theory." Electrons, however, come little into the scope of the present volume. The treatment is not deeply mathematical, but aims in its reasoned description of all the inter-connected phenomena to establish firmly in the student's mind the foundation on which the mathematic theory may be built up. Excellent as is the first part, with its well-balanced, logical sequence, and the clearness of such passages as that describing the physical nature of electric strain, many readers will be more attracted by the section on magnetism. This

opens with a masterly "general account of magnetic action," makes us enthusiastic over the beauty of Ewing's molecular theory, and brings together and points out the meaning of many recent scattered researches in the properties of paramagnetic and diamagnetic, as well as ferromagnetic bodies. There is also a chapter on terrestrial magnetism, and the important Zeeman and other interactions of magnetism and light are discussed in the concluding pages.

**The Elementary Principles of Illumination and Artificial Lighting.** By A. Blok. 248 pp. 7½ in. by 4½ in. 126 figures. (London: Scott, Greenwood & Son.) 3s. 6d. net; abroad, 8s. 10d.

The author deals equally with all sources of artificial illumination, and condenses into a small volume an extensive survey of the general principles of illumination. After notes on the nature of light and its production, the units by which it is measured, and the standards to which these are referred, he plunges into practical calculations, and indicates methods by which the illumination produced by given sources in given circumstances may be calculated. In the earlier part, perhaps, it is not quite enough insisted upon that the law of inverse squares does not always hold good when part of the light, as is more often the case than not, comes from reflectors, and some of the calculations which the reader might deduce from polar curves would possibly give inaccurate results from this cause, despite the rather inconspicuous warning in the chapter on reflectors, globes, and shades. He develops also, however, useful methods of calculation in terms of total flux of light (lumens), which are probably free from this objection. There is a wealth of quantitative material of a thoroughly practical nature in the latter part of the book which should be of great help to those planning actual installations, and notes and data both on interior lighting and street lighting are excellent.

**T.S.F. La Télégraphie sans Fil. La Téléphonie sans Fil. Applications Diverses.** By G. E. Petit and L. Bouthillon. 243 pp. 10 in. by 6½ in. 185 figures. (Paris: Librairie Ch. Delagrave.) 7s. 6d. net; by post, 7s. 11d.

The authors have had in mind to show what progress has been made in the art of signalling through space without wires during the last fifteen years, to state the position at the present time, and to indicate that finality in design or achievement has not yet been reached. To this end the book is divided into two parts. The first part deals with the theory and connections of apparatus, as well as with concise descriptions of almost every piece of apparatus used in modern systems of wireless telegraphy. The second part is devoted more to a consideration of long-distance transmission, and although some information of an historical nature is given, by far the greater space is devoted to a description of modern stations and their achievements. Particulars of the time signals and weather reports sent out from the Eiffel Tower are given, and the International Convention agreed to in London on July 5th, 1912, is published, we believe, for the first time, in full. This occupies some sixty-four pages, and forms an important appendix. Another appendix is devoted to an investigation into the problem of radiation from different kinds of aërials, and directive aërials. As would be expected from the pen of MM. Petit and Bouthillon, the subject is adequately treated, and gives most interesting reading.

**Practical Uses of the Wave Meter in Wireless Telegraphy.**

By J. O. Mauborgne. 74 pp. 9½ in. by 6 in. 42 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 4s. 2d. net.

The scope of this book cannot be better expressed than by quoting the following from the Preface:—"In its original form this work was first privately printed for reference use at the Army Signal School, Fort Leavenworth, Kansas, and, in 1912, was, by direction of the Secretary of War, adopted for use at that School . . . and in its present form is now published for commercial and technical-school use." As one would expect in such a treatise, no matter of purely academic interest is included, but there is a quantity of theoretical and practical information as to wave meters in general, and their uses, especially as regards tuning the sending station, measurement of damping, and logarithmic decrement, and measurement of the wave-length of the receiving station. A valuable chapter on the measurement of the capacity and inductance of the different parts of wireless installations is also given. Included are concise instructions for the determination of coefficients of self-inductance, mutual inductance, and coupling. Instructions are given for the





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use of a logarithmic chart for the calculation of frequency, wave-length, inductance, and capacity of oscillatory circuits, so that the necessity for more or less lengthy calculations, which are also fully shown, is avoided. Although, perhaps, it deals with some apparatus not much used in this country, yet similar principles apply to all—there is matter not before so conveniently put in print, which makes the publication of value to operators who wish to understand fully the many uses of a wave meter, and to experimenters.

**Incandescent Electric Lamps and their Application.** By D. H. Ogley. 107 pp. 7½ in. by 5 in. 59 figures. (London: Longmans, Green & Co.) 2s. 6d. net; by post, 2s. 9d.

The greater part of this book deals with illumination in general, and the general principles of the production and transmission of light and of photometry are clearly explained in the first five chapters, which form nearly half of the book. A rather brief sketch of the history of the incandescent lamp follows, up to and including the tungsten drawn-wire filament, but unfortunately the book has gone to press too early for treatment to be included of the half-watt lamp, which is likely to have so important an influence on incandescent electric lighting. Another chapter gives an interesting series of curves of life-tests, candle-power, and voltage relations, and so forth. The physiological aspect of the question is then taken up, and the effect of light on the eye is studied. We then come to the practical side of the subject, or, as it is now the fashion to call it, illuminating engineering; and the remaining third of the book discusses the direct, indirect, and semi-indirect systems. In our opinion these sections are not quite up to the standard of the first portion. It is true there are copious illustrations of commercial patterns of shades and reflectors, and a good idea is given of the distribution of light obtained by their use. Views of installations are also included; but there is rather a lack of quantitative information, such as would be required in planning an actual case. This is particularly so in the section on indirect lighting, which reads a little like an advertisement, and does not give sufficient data to enable one to determine what sizes of lamps are desirable in order to study the subject from the economic point of view; nor is it satisfactorily explained how to estimate the illumination produced either on the ceiling or the working plane. There is, however, a chapter at the end entitled "Further Illumination Calculations," but this is not in a very practical form; also, it relates, as far as we can see, only to direct lighting. The subject of street lighting by incandescent lamps does not fall within the range of the book. In short, we think that the first portion could have been somewhat compressed without losing any of its clearness of enunciation of first principles, while in the latter part quantitative examples and practical methods of calculation, or where these are impossible, empirical rules drawn from practice, might have occupied a larger proportion of the space.

**American Electricians' Handbook.** By T. Croft. 711 pp. 7 in. by 4½ in. 792 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.

This is a thoroughly practical handbook in that the proportion of really practical hints to the more academic side of the subject is larger than is usual in publications of the pocket-book class. In some ways the work relates more to American practice than to conditions prevailing over here, and British readers will find the use of the circular mil in the wire tables a handicap. Nevertheless, a very large proportion is of universal application. The largest section is devoted to interior wiring, and contains many practical hints not usually found in print; and the section on illumination, while concise, is full of good quantitative data. The generator and motor section is, as it should be, addressed to the user rather than to the designer and manufacturer, and there is a mass of well-chosen miscellaneous electrical information. It should be mentioned that telephone and bell wiring is dealt with as well as electric light wiring, but that neither electric traction nor high-tension transmission are included. The work is not addressed to engineers planning great schemes, but is intended to be a help to a larger class of electrical workers in their everyday work.

**A Handbook of Wireless Telegraphy.** By J. Erskine-Murray. 442 pp. 8½ in. by 5½ in. 208 figures. (London: Crosby Lockwood & Sons.) Fifth edition. 10s. 6d. net; abroad, 11s. 2d.

It is only a few months ago that we welcomed a fourth

edition of Dr. Erskine-Murray's book on wireless telegraphy, and the appearance of a fifth edition so soon is a guarantee that the work has merits that are appreciated. The author has, however, been able to make a certain amount of revision, principally in matters of detail, and the new additions relate chiefly to the uniform alternating-current and shock-excitation systems. Recent measurements of transmitted power are also included. The book throughout is written in an interesting and readable style, and displays considerable originality in expounding the author's points of view, which enables the reader to obtain a very clear grasp of the physical nature of wireless telegraph phenomena.

**Wireless Telegraphy: A Handbook for the Use of Operators and Students.** By W. H. Marchant. 241 pp. 7½ in. by 5½ in. 154 figures. (London: Whittaker & Co.) 5s. net; abroad, 5s. 4d.

The first few pages of this book are not so good as the later ones, owing, no doubt, to the author's endeavour not to devote too much space in explanations of electrical and magnetic phenomena. As a result of this policy, there is a tendency to cite special cases as general, and in several places the accuracy of statement has suffered through undue compression. The descriptions of the action of different pieces of apparatus is not always clear on first reading. On the other hand, the author has held the balance between the chief systems in use in this country and on the Continent, and has included good representative examples, with well-drawn diagrams and illustrations of special apparatus. Some space is devoted to portable installations, and there is much of use to operators on the care and testing of their apparatus. At the end are some abstracts from the Official Regulations, and instructions for both ship and shore stations. There has been no attempt to go into details of construction, but there is sufficient technical matter to enable students with some knowledge of electrical science to sit successfully for the Post Office examination for wireless telegraphists.

**Handbook of Electrical Methods.** Compiled from the *Electrical World*. 285 pp. 9½ in. by 6½ in. 386 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.

The contents of this book consist entirely of extracts from the *Electrical World* (New York) on those subjects which relate, to use the words of the preface, "purely to ways of doing things rather than to design, descriptions of apparatus, or to the commercial side of the electrical industry." The articles are conveniently classified and arranged, and a great deal of practical detailed information is included which is not of a nature usually incorporated in text-books. A certain proportion relates more to American than to British conditions; but there is a good deal of universal application. The range of subjects includes overhead lines, meters, switchgear, and connections, electric lighting and signs, transformers, interior wiring, motors, motor-generators, &c.

**Electrical Engineering Problems: Part I., Direct-Current Circuits and Apparatus; Part II., Alternating Current Circuits and Apparatus.** By F. C. Caldwell. 105 pp. 9½ in. by 6 in. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 4s. 2d. net.

The questions are graded as regards difficulty and subject, and would be suitable for second and third year electrical engineering students in our technical colleges, except that B. and S. wire gauge is used, and resistivity is given per mil-foot. There are 222 questions relating to D.C. circuits and machinery, and 390 relating to A.C. circuits and machinery. A guide to the real difficulty of each question is given by a suggested time necessary for solution after each. The relative values are about correct, but the actual times given are much too low. Sheets giving the answers to the problems may be obtained by instructors only. Generally speaking, however, our instructors can devise and work out suitable problems themselves.

**Problems in Alternating-Current Machinery.** By W. V. Lyon. 136 pp. 9½ in. by 6 in. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 6s. 3d. net.

Some of these problems are suitable for more advanced students than the book reviewed above; otherwise the same criticism applies, except that the question of wire gauge does not enter in, and times for solution are not given. There

are ninety-eight problems relating to transformer design and working, 149 to synchronous machines, eighty to induction motors, sixty-one to rotary converters, seventy-five to polyphase circuits, and forty-four to non-sinusoidal waves. All are useful and many have been taken from practice. The answers will not be obtainable until the end of the year.

**Answers to Problems in Essentials of Electricity for Wiremen and the Electrical Trades.** By W. H. Timbie. 11 pp. 7 in. by 4½ in. 2 figures. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 1s. net.; by post, 1s. 1d.

These answers apply to problems set in Mr. Timbie's book, "Essentials of Electricity," reviewed in ELECTRICAL ENGINEERING for March 13th, 1913, p. 147, Vol. IX.

**Leitfaden der drahtlosen Telegraphie für die Luftfahrt.** By M. Dieckmann. 214 pp. 8½ in. by 6 in. 150 figures. (Munich: R. Oldenbourg.) 8s. net.; by post 8s. 6d.

The provision of wireless telegraph equipment for aerial craft introduces special problems and difficulties which do not arise with land stations. Not only is the weight of the apparatus an important consideration, but the absence of an available earthing point requires aerials of an entirely different design to be used. So far, information on these points has been somewhat scattered, and the increasing number of those interested in the subject will welcome a book specialising in this branch of wireless telegraphy. We would have wished, however, that the author had limited himself a little more to this specialised part of the subject, instead of wasting much of the earlier part of the book in the exposition of elementary principles. Those ignorant of the general principles will not require a book specialising on the aeronautical branch, while those taking up that class of work will have already had a general training in wireless telegraphy. We do not say that these first principles and their adaptation to the propagation of waves are not well handled, but we would rather have had more details of the actual methods and apparatus employed, and experience with their use. The second or practical section of the book is of great interest, especially that part relating to the arrangement of the antennae on aeroplanes and airships, and the methods adopted for ascertaining the bearings and locality of airships, a subject which has received a great deal of attention in Germany. As, however, so much space had been used up in the earlier part of the book for elementary matters, the treatment is disappointingly brief.

**Inventors and Patentees Year Book for 1914.** By W. H. TAYLOR. 739 pp. 7½ in. by 5½ in. (Manchester: Dexter Press, Ltd.) 7s. 6d. net.; abroad, 8s. 4d.

This, the first issue of the first year book devoted to patents questions, contains a quantity of information, both interesting and useful. Inventors and patentees could not fail, by a perusal of its contents, to obtain an insight into the working of the patent system of Great Britain, as well as the procedure to be adopted to obtain patents under varying conditions in other countries in and outside the National Convention. The approximate costs of obtaining foreign patents are also given, together with the actual fees payable to the respective governments, and the amount of protection obtainable. By far the larger proportion of the book is devoted to an exposition of the Patents and Designs Act, 1907, and Patent Office procedure. Lists of the publications issued by the Patent Office are given, and the names of those, together with the places where they may be seen in the different towns are stated. Considerable space is devoted to the question of foreign and colonial patents—the information given is of a useful character. The International Convention, as amended at Washington in 1913, is given in full, and a section is devoted to a discussion of the "relative inventiveness in Great Britain, United States, Germany, and France." One cannot quarrel with statistics, but what they show is a matter of opinion, and as some of the conclusions arrived at do not agree with the preceding statements, we would advise the author to revise carefully this section in the issue for next year.

**The Universal Electrical Directory.** (J. A. Berly's), 1914. 1,550 pp. 9½ in. by 6½ in. (London: H. Alabaster, Gatehouse & Co.) 21s. British and Colonial Sections only, 12s.

The contents of this directory are again divided into four sections, viz., the British, which contains some 14,000 names; Colonial and General, with 7,000 names; Continental, with 7,500 names; and U.S.A., with some 5,750 names. Each division is sub-divided into alphabetical and classified sections, whilst in the case of the British the geographical section, which has been found of immense utility, has been retained. Further facility of reference is afforded by means of a thumb index. The directory is not only a directory of names, but contains full details of all the electricity undertakings in the United Kingdom, and all the important ones in the British Colonies, and some other countries.

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## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,383.

I have a 30 h.p. three-phase motor, which is designed to run on a 365-volt circuit, at 580 r.p.m., 40 cycles. The only supply pressures available are 230 volts, and 625 volts, 40 cycles. What do you advise me to do?—"UTILITY."

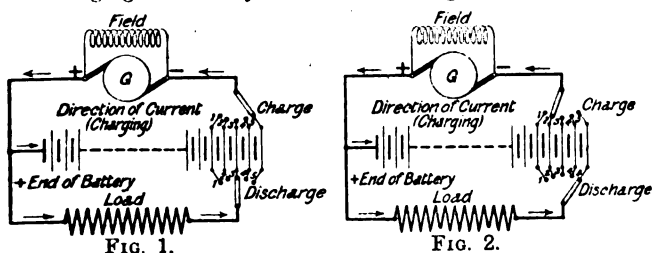
(Replies must be received not later than first post, Thursday, March 26th.)

### ANSWERS TO No. 1,381.

On accumulator switchboards for lighting installations, the charge and discharge regulating switches for the end cells are often interlocked, so that there cannot be more cells in the discharge circuit than in the charge circuit, at any time. Why is this?

The first award (10s.) is made to "A. E. B." for the following reply:—

The reason for this interlocking of regulating switches can perhaps be best explained by referring to the following diagrams. Fig. 1. shows the "charge" switch in position for charging full battery, and the "discharge" switch on about



mid-position, i.e., the end cells from 3 to 5 are not being discharged through the load. Now, should the battery be charging while the load is on, the dynamo, which is giving a higher voltage than the battery, will be both charging it and supplying current to the load. It is obvious that the end cells from 3 to 5 will also be charging at a more rapid rate than the others, due to the additional current from the load circuit passing through them. These end cells will probably be overcharged, but this will not harm them. Fig. 2 shows what may happen if the regulating switches are not interlocked. In this case more cells are shown in the load circuit than are being charged by the dynamo. It can easily be seen that the direction of current in these end cells will be the reverse to that in Fig. 1, i.e., they are being discharged. Should this go on for some time unnoticed, it is very probable they will be quite discharged and spoilt. In these diagrams I have omitted the usual switches, fuses, and automatic cut-out, &c., as they will only make them more complicated, and their insertion is not required for these remarks. In conclusion, I should like to state that it would not be necessary to have interlocking regulating switches where the battery is sufficiently large to take full load for a long period, as there is little likelihood of the two running

together for a sufficient length of time to discharge the end cells completely. It is only where, to save initial cost, a small battery has been installed, which it is intended should work with the generator during the period of heaviest load, that these switches should be installed.

The second award (5s.) is made to "C. E.," who writes as follows:—

Fig. 3 shows a simple diagram of connections for a small installation in which the supply can be obtained from the battery, or battery and dynamo combined, when supplying heavy loads. By manipulating the charge and discharge

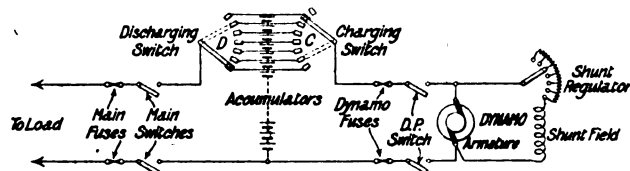


FIG. 3.

switches the dynamo can be arranged to charge the battery, and, at the same time, to supply the load, in the case of light loads. The charging and discharging switches C and D are often interlocked to prevent the switch C being placed on a lower cell than the switch D. Should this occur (as shown dotted in figure) the current passing to the distributing board would flow through the intermediate cells in the discharging direction, helping to discharge them. In a very short time the voltage of these cells would be reduced, the cells being sulphated and ruined. These end cells are often much larger than the remainder of the battery, as, even when the charge and discharge switches are correctly manipulated, some of the end cells have to carry the whole of the main current, unless C and D happen to be on the same cell. The necessary instruments are omitted in the figure to simplify the diagram.

**Tenders for Turbo-Generators.**—In consequence of representations made by the British Electrical and Allied Manufacturers' Association, the Incorporated Municipal Electrical Association has expressed the opinion that not less than three weeks is a reasonable time to be allowed for the preparation of tenders for turbine plant; and they ask their members to act in accordance with this view whenever practicable.

**Compulsory Working of Patents.**—The resolution proposed by the Manchester Chamber of Commerce was adopted at the meeting of the Association of Chambers of Commerce of the United Kingdom last week. The resolution aims at restoring the full effectiveness of Section 27 of the Patents Act, which deals with the revocation of a patent for non-working (see ELECTRICAL ENGINEERING, Jan. 22nd, p. 48, and Feb. 19th, p. 102). The resolution is as follows:—"That in view of the fact that Mr. Justice Parker's comments in *Hatschek's case* in the year 1909 as to the extent of the onus devolving upon any applicant who seeks revocation of a patent for non-working under section 27 of the Patents and Designs Act, 1907, have deprived the section of its effectiveness, this association urges upon the Government to amend the rules in such terms as will place the burden of proof on the patentee, while adequately safeguarding him from vexations and frivolous applications—an effect which was the object of those who drafted the Act of 1907; and that a deputation be appointed to interview the President of the Board of Trade on the subject." An amendment by the London Chamber to add: "And that as a preliminary to any action for revocation the applicant should prove that he has applied for, and been refused, a licence, or that the terms offered are unreasonable," was seconded by the Newcastle Chamber, was not agreed to.

**The Institution of Electrical Engineers.**—The following is the result of the ballot for the election of new members, and for transfers from one class to another, at the meeting on Thursday. Candidates elected:—*As Members:* H. Bille, O. Feldmann. *As Associate Members:* W. P. Fuller, M. Jernison, J. H. Tasker. *As Graduates:* E. Allington, W. S. Browne, P. C. Fernando, J. S. Hollinrake, W. Phillips, W. R. Williams. *As Students:* L. A. T. Broadwood, G. B. Burke, C. J. Burrage, A. N. Cam, F. A. E. Caspar, J. Cheshire, E. H. Croft, H. S. Cuerden, M. L. Delaney, F. Dixon, P. Dobie, J. M. Furnival, R. W. Harrison, F. C. Lawrence, W. H. J. Norburn, E. D. T. Norris, A. Nymau, H. P. Porter, H. G. Poynter, W. Sinclair, L. C. R. Smith, W. B. Smith, E. J. Symons, C. E. Tolley, S. H. Trippie. *Candidates transferred:* From Associate Member to Member: P. V. Hunter. From Student to Associate Member: A. C. Timmis, S. S. A. Watkins. From Student to Graduate: L. T. G. Mansell.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published March 12th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

4,082/13. **Electrolytic Manufacture of Copper and Zinc Oxides, &c.** C. WHITE. Copper, zinc, lead, tin, and bismuth oxides are obtained by the electrolysis of a boiling solution of an alkali chloride. The anode is of the metal whose oxide is required.

4,723/13, 4,724/13, and 4,725/13. **Furnaces for the Fixation of Nitrogen.** E. KILBURN SCOTT. Perforated horn-shaped electrodes consisting of a tube divided longitudinally into two compartments and with a cap slipped over one end, are used. Concentric tubes containing magnetite project into the gap and form auxiliary electrodes. Power is supplied through a transformer having considerable magnetic leakage at abnormal loads.

4,777/13. **Wireless Telegraphy.** F. J. CHAMBERS. An auxiliary spark gap, in series with the main gap, bridges a capacity or inductance. Resonance between primary and aerial circuits in quenched spark systems is thus automatically destroyed. Six figures.

6,341/13. **Alarms for Order Telegraphs.** R. W. WILLIAMS. A rotary switch is combined with a mechanical order telegraph to complete a bell circuit if the order is not obeyed. Three figures.

8,568/13. **Incandescent Lamps.** T. GUISTI. Drawn filaments are wound as a spiral, helical cone, or spiral pyramid, and mounted on a single central transparent stem. Four figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Names in *italics* indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** AYRTON [Electrodes] 1,775/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** BROWLASKI [Insulators] 7,382/13; MASCHINENFABRIK OEBLIKON [Circuit regulating relay systems] 15,060/13.

**Dynamos, Motors, and Transformers:** A.-G. BROWN, BOVERI ET CIE [Cooling of apparatus built in connection with a motor] 13,610/13; SIEMENS DYNAMO WORKS (*Siemens Schuckertwerke Ges.*) [Windings] 14,380/13; BROOKS & HOLT [Variable-speed dynamos] 15,686/13; CAMPBELL [Motors for portable drills, &c.] 16,428/13; ALEXANDERSON [Polyphase commutator motors] 19,517/13; SIEMENS SCHUCKERTWERKE GES. [Oil-insulated transformers] 24,117/13.

**Electrometallurgy and Electrochemistry:** HYBINETTE [Electrolytic extraction of copper from its ores] 22,744/13 and 22,745/13; YOUNT, FINIGAN, and BRANNAMAN [Welding] 24,472/13.

**Heating and Cooking:** STOTT and SCHOFIELD [Water-heaters] 5,432/13; SIEMENS SCHUCKERTWERKE GES. [Irons] 17,665/13.

**Ignition:** KETTERING, 4,508/13; NEUFELDT & KUHNKE [Multi-pole magnet] 12,956/13.

**Incandescent Lamps:** SIEMENS & HALSKE A.-G., 17,416/13.

**Instruments and Meters:** PAUL [Thermo-couples for pyrometers] 12,708/13; PAUL, BRAUN & Co. [Recording] 20,796/13.

**Switchgear, Fuses and Fittings:** B. T.-H. Co and HEATH [Switches] 1,599/13; BIGGE and BUTT [Automatic switch] 1,927/13; SIEMENS DYNAMO WORKS and RODGERS [Induction motor-starting switches] 4,507/13; HOPE [Enclosed switches] 7,918/13; DAY [Connecting lamp-holders to conduits] 8,445/13; SOC. ANON. DES ETABLISSEMENTS L. BLERIOT [Switches and contacts] 9,592/13; GARRECHT [Extensible lighting fittings] 12,238/13; LUNDBERG and PEGG [Switches] 14,188/13; DRYSDALE and DISPLAYER Co. [Working switches] 16,609/13; SIEMENS BROS. (*Siemens & Halske A.-G.*) [Relays] 22,902/13; SCLATER [Mounting switches, &c., in boxes] 24,809/13; SIEMENS BROS. (*Siemens & Halske A.-G.*) [Setting apparatus from a distance] 28,822/13.

**Telephony and Telegraphy:** DERRIMAN (*Auto. Enunciator Co.*) [Telephony] 26,781/12 and 26,782/12; AUTO. TELEPHONE MFG. Co. (*Auto. Elec. Co.*) [Telephone systems] 4,499/13; HARRISON and JACOBS [Selective signalling] 4,584/13; THOMPSON (*Soc. Anon. des Telegraphes Edouard Belin*) [Telegraph transmission systems] 9,624/13; MILLERSH-JACKSON (*Signal Ges.*) [Charging and discharging condensers] 15,284/13; STERLING TELEPHONE & ELEC. Co. (*Telephonfabrik A.-G. vorm J. Berliner*) [Telephone selector switches] 19,592/13.

**Traction:** RAMSEY and MALEY [Section insulators for contact lines] 4,931/13; SIMPSON [Sand discharge valves for electrically-driven vehicles] 14,459/13; UNDERWOOD [Trolley heads] 16,705/13; SIEMENS-SCHUCKERTWERKE GES. [Electric vehicles] 27,472/13.

**Miscellaneous:** B.T.-H. Co. and WHEAT [Illuminating devices] 21,485/12; PHILIP and STEELE [Combustible gas detectors]

5,467/13; FITHIAN [Governing speed of engines at sea] 5,763/13; LEAVITT [Starting and stopping automobile torpedoes] 6,060/13; GELSDORF [Remote control of door and window locking] 11,504/13; SIEMENS BROS. and HIRD [Revolution counter] 12,437/13; FRIEDR. KRUPP A.-G. GRUSONWERK [Magnetic separators] 14,426/13; SCHUMANN [Alarm preventing unauthorised opening of locks] 15,259/13; CANDOLITE Co. and TAUSSIG [Imitation candle lamps] 17,918/13; DUBASH [Alarm to indicate if ship engine movements disagree with order telegraph] 24,966/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Insulating Materials, &c.:** RENAULT [Vehicle lighting] 2,528/14; ELEKTRIZITATS A.-G. HYDRAWERK [Working weak-current installations] 4,237/14.

**Electrometallurgy and Electrochemistry:** LANDRELL [Treating liquids] 3,181/14; SOC. ELECTRO METALLURGIQUE DE ST. BERON [Furnaces] 3,835/14; HELFENSTEIN ELEKTRO GES. [Condensation of metallic vapours] 4,101/14.

**Heating:** A.E.G. [Composite heat storage apparatus] 4,355/14. **Instruments and Meters:** A.E.G. [Regulation of phase relations, current and pressure, in a Ferraris meter] 3,912/14.

**Switchgear, Fuses and Fittings:** DEHLER [Pendants] 25,666/13; MAITRE [Contact-breakers] 3,583/14; DEAN [Switches] 3,706/14.

**Telephony and Telegraphy:** GIRARDEAU [Wireless stations] 3,192/14; SOC. MARIUS LATOUR ET CIE [High-frequency transformation for wireless] 4,345/14.

**Miscellaneous:** MASCHINENBAU ANSTALT HUMBOLDT [Electromagnetic shaking feeds or jiggers] 3,986/14; HARTMANN & BRAUN A.-G. [Condensers of the ring type] 4,237/14.

The following Amended Specifications may now be obtained:—**Incandescent Lamps:** C. H. FISCHER [Drawn filaments] 9,981/12.

**Miscellaneous:** O. F. WERNDORFF [Signalling vehicle movements] 7,524/12; B. T.-H. Co. (*G. E. Co., U.S.A.*) [Furnace lining] 29,389/12.

### Opposition to Grant of Patent Entered

26,800/12. **Drawn Tungsten Filaments.** C. TRENZEN. Opposition has been entered to the grant of this patent (see ELECTRICAL ENGINEERING, January 22nd, p. 51).

### Grant of Patents Allowed

25,606/12. **Time Lag for Circuit-Breakers.** J. G. STATTER. The Comptroller has allowed the Grant of this Patent in spite of the opposition entered.

2,471/13. **Static Three Phase—Single Phase Transformation.** F. SPINELLI. The Comptroller has allowed the Grant of this Patent, subject to amendment.

### Expiring and Expired Patents

The following Patents expire during the current week, after a little of fourteen years:—

5,387 of March 21st, 1900. **Selective Wireless Signalling.** G. MARCONI. Transmitter and receiver have in circuit an induction coil and two conductors, one of which is earthed in each case. For the conductors, concentric insulated cylinders may be used; the inner one is earthed.

5,593 of March 24th, 1900. **Electrolytic Mercury Meters.** A. WRIGHT and REASON MFG. Co. This patent relates to several important details of construction. The well-known means of obtaining a second dial effect is disclosed. The chance of crystallisation at the anode is reduced by convection currents. An index tube is used as an anode feeder.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems:** C. DE KANDO [Cascade control of poly-phase motors] 25,829/02; W. H. SCOTT [Printing-press motor control] 25,887/03.

**Dynamos and Motors:** B. T.-H. Co. (*G. E. Co., U.S.A.*) [Self-exciting rotaries] 25,729/04; [Self-exciting homopolar machines] 25,730/04; ALLMÄNNA SVENSKA ELEKTRISKA AKTIEBOLAGET [Compensated repulsion motors] 25,537/08.

**Instruments and Meters:** C. FÉRY [Calorimeters] 23,996/07.

**Switches, Fuses and Fittings:** J. C. A. WARD [Attaching fuse-wire to carriers without screws] 21,642/00; G. CHARLTON and W. E. BARTON [Quick make and break switches] 25,954/01; VERITY'S and W. G. PIPKIN [Circuit-breakers] 25,333/08; A. WEST [Controller contacts] 25,721/08; W. B. THORPE and THORPE METER SYNDICATE [Electrolytically-controlled switches] 25,763/08.

**Telephony and Telegraphy:** E. H. CHAMBERS [Tubular poles] 21,615/00; P. O. PEDERSEN [Telegraph records] 23,738/01; W. P. THOMPSON (*Soc. des Telegraphes Multiplex—Système E. Mercurier*) [Three-coil transformer for duplex] 24,397/01.

**Miscellaneous:** J. RENNIE [Speed indicators] 25,836/03.

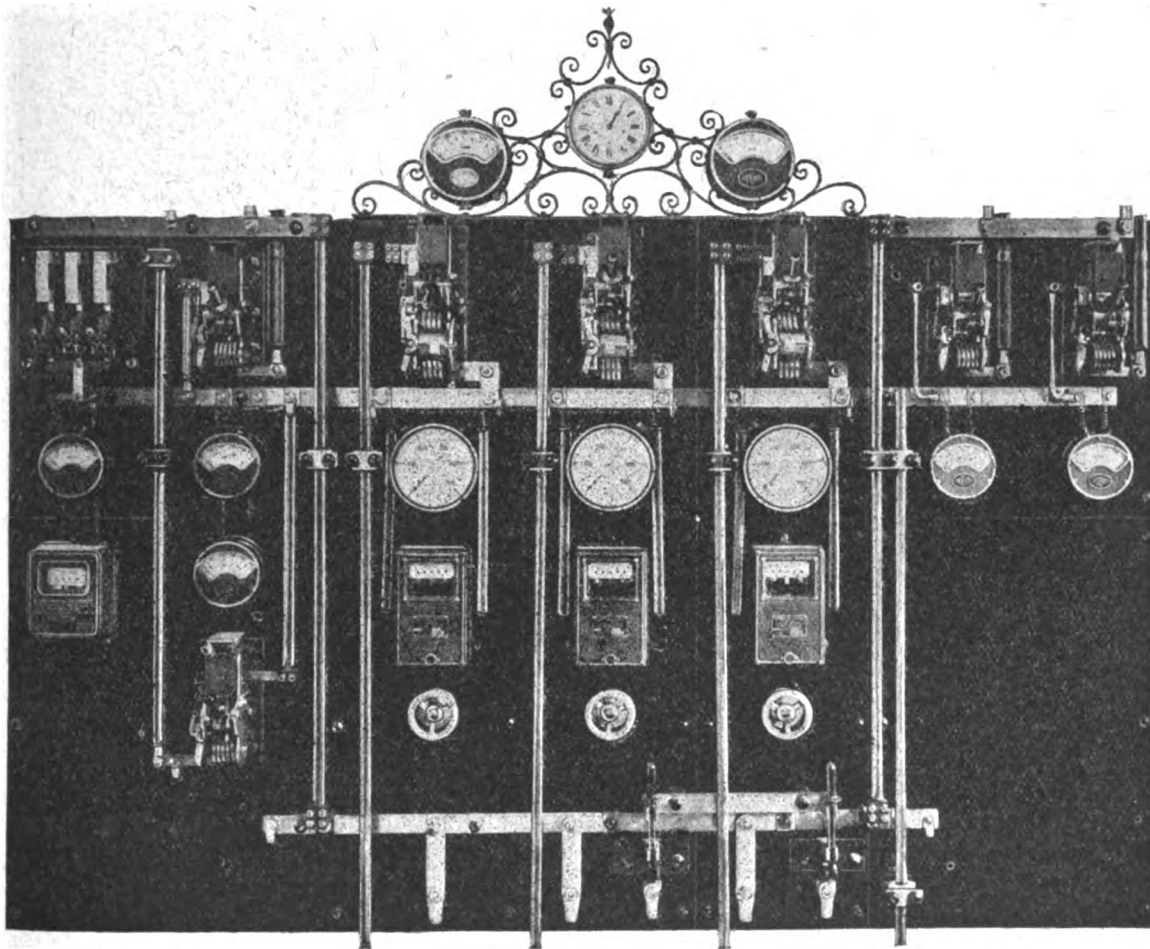
## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 170. —

### A FRONT-CONNECTION SWITCHBOARD

WE are enabled, by the courtesy of the manufacturers, the Kartret Engineering Co., Queen Anne's Chambers, Westminster, to illustrate a neat front-connection switchboard for the St. Ivel Factory at Frome. It was found that there was not space in the engine-room for a board of the ordinary type, and so the construction shown was adopted. The depth from the wall to the extreme tip of the circuit-breaker handles is only 16 in. The board itself is 10 ft. long, and is made of enamelled slate sections fixed to

at the bottom. There are also three 50-ampere main lighting circuits fitted with "Kartret" switches and fuses. One voltmeter is permanently connected across the bus-bars, and the other will be connected by a three-way switch across the generators as required. The shunt field regulators are situated in the room next to the engine-room behind the switchboard. Record ammeters, some of which are of the "Circscale" pattern, are used, and the shunts are neatly arranged in front of the bars. There is no live metal on the back of the board, and the design is such that every piece of apparatus can be easily removed without upsetting the general arrange-



FRONT CONNECTION SWITCHBOARD FOR ST. IVEL FACTORY AT FROME.

an angle-iron frame. There are two 44-kw. and one 33-kw. 110-volt compound-wound generators, the leads from which are brought along a duct under the board. The equaliser bar is seen at the bottom, just above, and in front of the negative bus-bar, which is earthed. The disconnecting links are also clearly seen. For convenience this bar is made in three sections. Two are fixed at the top of the board, as the motor and lighting circuits supplied are led upwards. All the connections are of solid copper rod fitted with insulating bushes and outer fibre protecting tubes. Fireproof screens are also to be fitted at one or two points on the board where the maximum pressure between two points a few inches apart occurs. The generators are connected through the Whipp & Bourne overload and reverse circuit-breakers on the middle panels, and through Chamberlain & Hookham meters to the positive bus-bar. Five of the six 20-kw. motor circuits are also taken through overload circuit-breakers. One of these is arranged low down, as the connections in this case go out

ment. The board was made to the order of Cecil Cooper & Co. (Albert Road, Bournemouth). Mr. Phillip Dawe (Dacre House, Westminster) was Consulting Engineer.

**Siemens' Bohemian Concert.**—A rollicking Bohemian concert was held at Anderton's Hotel on Friday last, in which both the Upper Thames Street and Dalston Works staffs of Siemens Bros. Dynamo Works, Ltd., participated. The Dining Hall, where the concert took place, was filled to its utmost, and among the audience was a proportion of ladies. This is the first time that the staffs at Dalston and Thames Street have held a joint concert, and the appreciation shown for the different items would indicate that the innovation is a success. The programme was divided into two parts, with a short interval between, and there was a different chairman for each: Mr. A. H. Bate officiated at the first, and Mr. W. Le Marechal at the second. Mr. E. C. Laughton replied to the toast of the Dalston staff. It was not until a late hour that the jovial party broke up.



## CATALOGUES, PAMPHLETS, &c., RECEIVED

**STEAM TURBINES.**—An illustrated pamphlet describing the Willans' "Disc and Drum" turbine, has just been issued by Willans & Robinson, Ltd. (Victoria Works, Rugby). The advantages of a preliminary impulse stage, through which the steam passes before finishing its expansion, are set out, and the saving in space against a purely reaction turbine is clearly shown by illustrations. The construction of the well-known Willans' shrouded blading is explained, and various mechanical details are illustrated. Photographs of many recently erected turbo-generator sets are reproduced, and interesting particulars are given of back pressure and "pass out" turbines, exhaust steam, and mixed pressure turbines, special attention being given to the governor gear of the last-mentioned. A list is also given of turbines recently supplied.

**IRONS.**—A leaflet from the Edison & Swan United Electric Light Co., Ltd., (Ponders End, Middlesex), sets forth the advantages of the "Ediswan" 6 lb. domestic iron. This is of a very simple and robust construction, and if the element itself should fail a new one can be inserted by the user in a few moments. A modification has lately been made in the design of the handle, with the object of making the running of the iron as easy as possible.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ASBESTOS-WOVEN NET RESISTANCES.**—A series of leaflets issued by the Schniewindt Electric Co. (40 and 41 Stanforth Street, Birmingham) describes the construction of its British-made asbestos-woven net resistances. These can be used for motor controllers, lamp dimmers, heaters, electro-medical apparatus, &c. Full information is given as to mounting and spacing the nets, so that adequate ventilation is obtained. These nets are very convenient for all control apparatus, as they are light, compact, cheaply mounted, have a large radiating surface, are not affected by vibration or jolting, and are suited for fine gradation, as it is easy to make tapplings. The prices of standard nets from the smaller size motors from 100 to 550 volts are given, but the nets can be made in quite large size, and may be used for large installations. The system is easily adaptable to heaters in different forms for small or large currents, and prices of a wide range of standard nets for these purposes are contained in the list before us. The "Triumph" aluminium water-boilers and stewing-pots, and the "Peerless" pipe-cutting pliers for contractors, wiremen, fitters, and others, are also brought to notice.

**BEARINGS.**—We have received from Chas. A. Matthews, 22 Bridge Street, Deansgate, Manchester, a catalogue of "Bamag" bearings. These bearings are of the ring lubricated type of special design, and are made both in a self-aligning form with swivelling bushes, or in the ordinary fixed form. The list is very complete, embracing many designs of bearings for use in different circumstances, and interesting information and illustrations relating to their manufacture and use are given.

## AN INTERLOCKED SWITCH PLUG

WE have received from the British Thomson-Houston Co., Ltd. (77 Upper Thames Street, E.C.), particulars of

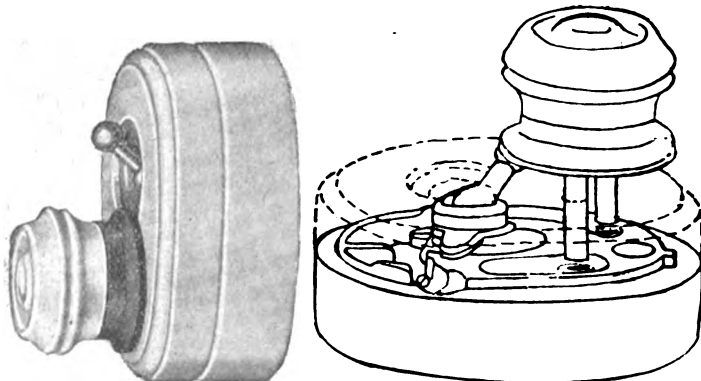


FIG. 1.—INTERLOCKED SWITCH PLUG.

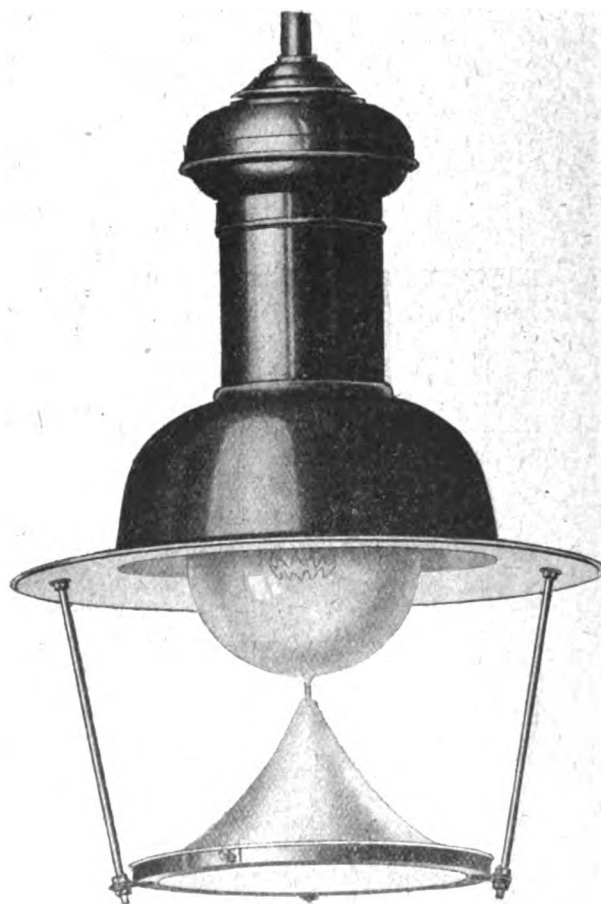
FIG. 2.—PLUG PREVENTED FROM BEING PUSHED HOME WHEN SWITCH IS ON.

an extremely simple but ingenious interlocking switch plug for use on heating, cooking, and other circuits. The object

aimed at is to make it impossible for the plug itself to be inserted when the switch is on, and to ensure that the circuit is broken before the plug is withdrawn. There is no mechanism at all; the interlocking action is achieved by having the knob of the switch in such a position that it overlaps the plug, so to speak. When the switch is on, the plug cannot be pushed in sufficiently far to make contact, owing to the interposition of this knob, as shown in Fig. 2. Again, on withdrawal the switch is pushed off by the fibre guard of the plug. The switch is at present made with a carrying capacity of 5 amperes, in the pattern illustrated, but there a 10-ampere size and a flush pattern in preparation.

## A HALF-WATT LAMP FITTING

WE illustrate here a special fitting for half-watt lamps with special reflectors, giving particularly good distribution of candle-power, which has been placed on the market by the Wardle Engineering Co., Ltd. (196 Deansgate, Man-



HALF-WATT LAMP FITTING.

chester). The external reflector affords the necessary protection from the weather, and the lower reflector is so formed that with a lamp rated at 3,000 c.p. as much as 5,000 c.p. is obtained at 20° below the horizontal. We understand that immediate deliveries can be given.

**Electric v. Gas Power.**—In connection with the relative merits of gas engines and electric motors for driving machinery, the following letter, which has been sent us by the British Thomson-Houston Co., Rugby, is of interest: "I have just been looking over your advertisement in the . . . and as it is now over twelve months since I had one of your 18 h.p. motors installed at my works (the Southend Machine Joinery Works), I feel it is only due to you to let you know that I am more than satisfied with its working, both in output and economy. It seems to me there is no comparison in the saving from first to last as against gas engines, besides which the motor is so clean, and takes up no room, and expense for oil is almost nil. You can make what use you like of this, because I am sure it is only by giving the results of practical tests that outsiders will be taught the possibilities of the up-to-date motor. (Signed) JOHN C. BEALE."

## A CHINESE CALENDAR

INSPECTION of the photograph reproduced here reveals some old friends surrounded by unfamiliar descriptive matter, and without having resource to reading the English characters at the top it can be seen by the Osram lamps, Freezor fans, and Magnet kettles, that it is a publication

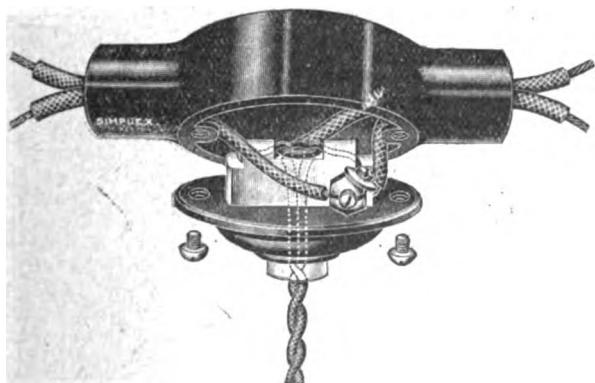


of the enterprising General Electric Co. of China, Ltd., on behalf of their Chinese friends. The production is of a clever design, printed in a number of colours, and it is most interesting to see how the General Electric Co. have introduced their various specialities into the pictorial idea.

## ACCESSORIES FOR CONDUIT WIRING

IN addition to the porcelain interior for conduit boxes illustrated in ELECTRICAL ENGINEERING, Feb. 26th, p. 122), Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), have introduced the special design for ceiling-roses shown here.

This "Condulet" is firmly fixed in position, so that there



"CONDULET" CEILING FITTING.

is no risk of the terminals touching the sides of the iron box, and, as in the other case, the terminals are of large size, hexagonal in shape, and have a slot in the centre, so that there is no necessity to sever the conductor when wiring.

PUT YOUR

## DAY LOAD

UP 20 KWS. PER DAY  
THIS COMING SUMMER

BY PUSHING



A very strong practical article which does any kind of cooking operation, and uses any existing utensils.

A consumer who already has a "Belling Fire" will buy a "Belling Ring" at sight.

After a few weeks' use your customer will be so delighted with it that you will have no difficulty in selling a further addition, namely a "Belling Grill." This fits the same switch panel by just changing over the plugs (anything which has been previously boiled on the Ring can be kept boiling on the top of the grill whilst that article is being used, so that the 2 utensils with the one switch panel make a complete breakfast set).

When the weather gets really hot, a call by your representative explaining how the kitchen can be kept so cool, how a considerable saving in the meat bill is possible, how all the delicious flavour is retained in the cooked meat and done without any trouble by an Electric cooking oven, creates new interest.

When he further explains that the same reliable make, using the simple interchangeable plug system, can be installed straight away—well, that just clinches the matter. (With the Cooker it is best to add another switch panel, so that there are 2 panels for the 3 articles). Switch panels have Diamond H Switches, "Z" Fuses, Reyrolle 3 Pin Plugs.

It is scarcely necessary for us to add that this, our new "unit" system, enables you to sell to each consumer a complete cooking outfit by degrees, and its advantages in the event of accidents or renewals are obviously apparent.

We can despatch Rings in about 2 weeks.

We can despatch Grills in about 6 to 7 days.

We can despatch Ovens (certain sizes) in about 8 to 10 days.

Send your order for trial sample now.

BELLING & CO., COOKING SPECIALISTS, EDMONTON.

**MICA** BRITISH MICA CO., LD.  
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Plate Tubes,  
Rings, &c., in **MICANITE**

**GLASS TUBES  
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THE BEST INSULATING AND IMPREGNATING  
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**James Macintyre & Co. Ltd.**  
Manufacturers of  
PORCELAIN  
**INSULATORS**  
of every  
description  
Washington Works, Burslem.

### Half Watt Postcards

Sample and Prices  
- on Application -

Kilowatt Publishing Co., Ltd.,  
203 Temple Chambers, London, E.C.

**F. WIGGINS & SONS,**  
FOR **MICA** INSULATION  
102, 103 & 104, MINORIES, LONDON.

The Fearful Frown,  
A sorry sight,  
Bad luck to crown,  
He's lost Fluxite.

The  
**PRACTICAL MAN**  
insists on having  
**FLUXITE**

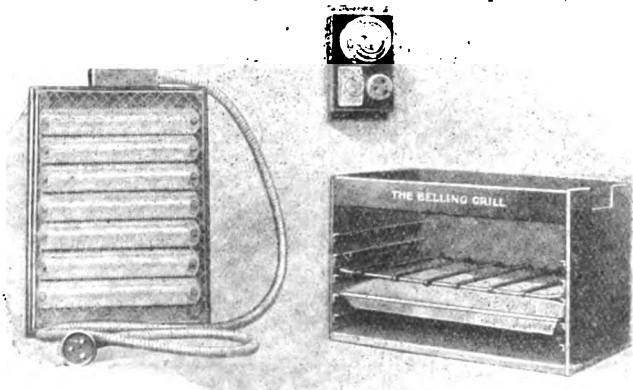
The paste flux that  
**SIMPLIFIES SOLDERING AND LEAD JOINTING.**  
It solders even dirty metals without cleaning, and is safe for electrical work. It joints lead without solder merely by the use of a blow-lamp or blow-pipe. If desired some solder can be powdered into a little Fluxite and the two applied together.  
Of Ironmongers, etc., in 6d., 1/- and 2/- Tins.  
Made by the AUTO CONTROLLER CO., 70, Vienna Road, Bournemouth.

**INSIST ON HAVING**  
*"Calor"*  
**Electric Cookers and  
Red Hot Fires**  
**RELIABLE EFFICIENT ECONOMICAL**  
**TOWNSHEND'S ART METAL CO., Ltd.,**  
Works and Showroom—  
Ernest Street, Birmingham.  
London Showroom—  
62, Holborn Viaduct, E.C.

It is possible to attach the flexible conductor to the terminals, together with its lampholder, at the bench, instead of, as is usual in wiring ceiling roses, having to work in an awkward position on the top of a ladder. The gripping arrangement relieves all direct pull on the terminals. The flexible is taken through a centre hole in the porcelain, and a small rubber ring is fitted, which by the weight of the shade on the end of the flexible is compressed and forms an effective grip, as well as an anti-vibrator. The cover is of better appearance than the ordinary white porcelain rose, and any finish can be used in keeping with the style of fitting. The fitting is supplied with the standard type of circular box, 3½ in. by 1½ in. deep in all the combinations.

### A NEW GRILLER

WE are able to illustrate the new griller recently perfected by Belling & Co. (Derby Road, Edmonton, N.). As may be seen from Fig. 1., seven "Belling" standard fire-bars are used. They are all connected in parallel, as each



BELLING GRILLER.

one can be wound for any pressure up to 500 volts, giving a total loading of 2,300 watts. Three degrees of heat are provided, and it is arranged that only the three middle bars are in circuit for cooking small joints. The elements are protected by means of a wire guard, and the top, complete with all

connections, may be removed from the body in a few moments. The size of the cooking space provided is 15 in. long, 8 in. high, by 12 in. deep, and the walls are made of sheet-steel with wired edges, thus making a strong, light, portable article. A drip pan, rack, and a loose front plate for converting the griller into a small oven are provided. The three terminals are arranged outside, so that they keep cool. A new design of a complete cooker, built up of unit parts, is also being put on the market.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Bacup.**—An application is to be made for a loan of £1,000 for extensions.

**Blackrock.**—Mr. J. P. Tierney, Consulting Engineer of Dublin, has been retained to advise the Council as to an electric supply scheme.

**Bury St. Edmunds.**—It has been decided to replace the existing storage battery with a new one of the same capacity at an estimated cost of £750.

**Devonport.**—Tenders are invited for a 1,250-kw. turbo-alternator and two 500-kw. rotary-converters and switchgear. (See advertisement on another page.)

**Dublin.**—An application is to be made to the Local Government Board for sanction to a loan of £77,000 for extensions.

**Edinburgh.**—Tenders are invited for a twelve months' supply of arc-lamp globes, cast-iron pavement boxes, and underground cable conduits. March 28th. Borough Electrical Engineer.

**Knaresborough.**—The Council has decided to proceed with the electric supply scheme prepared by Mr. George Wilkinson, Borough Electrical Engineer at Harrogate, outlined in our issue of February 26th.

**Southampton.**—Tenders are invited for a supply of cable for twelve months. March 27th. Borough Electrical Engineer. (See advertisement on another page.)

**Virginia (Co. Cavan).**—A Local Government Board inquiry will be held on the 31st inst. into a loan for public lighting.

**Warrington.**—Tenders are invited by March 31st for a 750-kw. rotary-converter and E.H.T. switchgear. Borough Electrical Engineer.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Croydon.**—Six houses, Cedar Road. J. S. Findlay, 18 Addiscombe Court Road.—Twelve houses, Woodside Court Road. R. B. Manser, 6 Guy Road, Beddington.—Five houses, Enmore Road, South Norwood. A. C. Blake, 10 Everton Road.—Eight houses, Grant Road. H. Felder, Grant Road.

**Eccleshall.**—New children's home.

**Hanley.**—Music hall in Stafford Street.

**Gosport.**—New Conservative and Unionist club. Architect, E. J. Thomas.

**Grimsby.**—New constitutional club. H. W. V. Shekell, Secretary, Victoria Street, Grimsby.

**Lisnaskea (Co. Fermanagh).**—It has been decided to light the workhouse by electricity.

**London: L.C.C.**—Tenders are invited for an electrical installation at Moxey Road Centres, Woolwich. About 65 points. March 23rd. (See advertisement on another page.)

**Manchester.**—Extensions to Monsall Hospital. City Architect.

**Mansfield.**—Hospital.

**Salford.**—Additions to workhouse.

**Stockport.**—New offices for Prudential Assurance Co.

**Torquay.**—New theatre. Architects, Richardson & Gill.

### Miscellaneous

**Australia.**—A supply of electrically-controlled clocks is required by the Postmaster-General, Sydney. Further particulars from 72 Victoria Street, S.W., or 73 Basinghall Street, E.C.

**South Africa.**—The Durban Corporation requires two electrically propelled ambulances. London Agents, Webster, Steel & Co., 5 East India Avenue, Leadenhall Street, E.C.

## TENDERS RECEIVED AND ACCEPTED

**Bolton.**—A contract for a supply of "Traction" type tantalum lamps for twelve months has been given to Siemens Bros. Dynamo Works, Ltd.

**Dublin.**—A contract for the supply of metal filament lamps for the tramway service has been given to the Edison & Swan United Electric Light Co.

**Exeter.**—The tender of the British Thomson-Houston Co. for a 1,000-kw. turbo-alternator at £4,211 has been accepted.

**London: Hammersmith.**—The tender of Doulton & Co. for 2,000 yds. of single-way cable duct has been accepted.

**L.C.C.**—The tender of Johnson & Phillips for 150 two-way change-over switches has been accepted at a price of £262 10s. Three other tenders were received.—The tender of Pope's Electric Lamp Co. for metal filament lamps is recommended for acceptance.

**Rochdale.**—The tender of James Howden & Co. for two turbo-alternators has been accepted. The General Electric Co. will be the sub-contractors for the alternators, and W. H. Allen, Son & Co. for the condensing plant.

**Whitehaven.**—The tender of Chamberlain & Hookham for meters has been accepted.

Messrs. Scholey & Co., Ltd., have received from the Maschinenfabrik Oerlikon an order for their special tool steel gear wheels and pinions for the motor equipments to be used in the electrification scheme of the London & North Western Railway.

The Mirrlees Watson Co. inform us that they have recently received orders for condensing plant for Leeds Corporation (per Willans & Robinson); Haunchwood Colliery and Griff Colliery (per Greenwood & Batley); Millom & Askam, Hematite Iron Co., Ltd. (per Fraser & Chalmers); Langwith Colliery, Enfield Lock (per Jas. Howden & Co.); Burgh of Kilmarnock; Ardrossan Harbour Co.; Frickley Colliery; Swanwick Colliery; Brunner, Mond & Co.; and Hulton Colliery.

Joseph Kaye & Sons, Ltd. (Lock Works, Leeds), inform us that they have just received further orders from the

British Navy for 4,468 of their patent seamless serrated oil-cans, with seamless spouts, making a total of 60,048 of this particular pattern alone to be distributed next month to the different dockyards.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £65 10s. to £66. (Last week, £65 15s. to £66 5s.)

**Agencies.**—George Ellison (Victoria Works, Warstone Lane, Birmingham) has appointed Kelsall & Parsons (Caledonian Chambers, 87 Union Street, Glasgow) as Agents for Scotland, and also Mr. A. B. Gott, Independent Buildings, Fargate, Sheffield, as representatives for South Yorkshire, Nottinghamshire, and Derbyshire.

**Bankruptcies.**—The trustees in the bankruptcy of Charles Lewis, Electrical Engineer, 29 Seymour Grove, Old Trafford, Manchester, have been released.

The first meeting of creditors in the bankruptcy of the Stolz Electrophone Co. will be held on March 24th at 11.15 a.m., at 33 Carey Street, Lincoln's Inn, W.C., and that of the contributories at 12 on the same day, at Bankruptcy Buildings.

## APPOINTMENTS AND PERSONAL NOTES

The salary of Mr. J. A. Bell, City Electrical Engineer, Aberdeen, has been increased from £700 to £750.

The salary of Mr. E. Fitzgerald, of the Dublin Electricity Department, is to be increased from £160 to £220, rising by increments of £10 to £300.

The salary of Mr. W. M. Rogerson, Borough Electrical Engineer at Halifax, has been increased from £600 to £700.

Mr. F. G. Richardson, of Bradford, has been appointed Tramways Manager at Colne, at a salary of £225 per annum.

Mr. W. R. Rogers, District Engineer to the Newcastle-upon-Tyne Electric Supply Co. for the Pelaw Felling district has been appointed District Engineer to the Gateshead district.

An additional draughtsman is required by the Hammersmith Electricity Department, at a salary of £150 per annum.

**Strike of Osram Bulb-Makers.**—At the Lemington Glass Works, near Newcastle, which are connected with the Osram Lamp Works, manufacture the glass bulbs for Osram and Robertson lamps, and are the only works of this character in England, some new machines were introduced a few months ago for opening and closing the moulds into which the bulbs are blown. Although such machines are in use in similar works all over the world, the workmen resented their introduction; eighty men and boys came out on strike at the end of last week, and over 300 other employees were thereby rendered idle. The machines in question certainly do away with some unskilled boy labour which was hitherto required, but, of course, do not in any way affect the apprentices who are learning the glass-blowing trade. So far as the glass-blowers are concerned, instead of diminishing their earnings, the wages sheets showed actually an average increase of 10 per cent since the introduction of the machines, and the consequently accelerated output. Without the machines, the works would be run unprofitably, as all the bulbs needed could then be obtained from the Continent more cheaply, and we understand that the management of the works is firmly refusing to discontinue the use of the machines in question.

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## LOCAL NOTES

**Brentford: Gas Co. and Electric Supply.**—The Bill of the Brentford Gas Co., which asked for powers to apply to the Board of Trade for electric lighting orders, as mentioned in our last issue, was passed by the House of Lords Committee on Thursday. There were considerable modifications in the Bill, but these referred mainly to the gas supply powers. So far as the Company's electric lighting orders are concerned, it is authorised under the Bill to apply to the Board of Trade for electric lighting provisional orders in any districts in its area not supplied with electricity at the time of any application, and similar powers are taken to apply to the Board of Trade to take transfers of existing electric lighting orders for electrical undertakings. The Metropolitan Electric Supply Co.'s opposition will be renewed when the Bill comes before the House of Commons, and accordingly they took no part in the framing of the clauses. Another portion of the Bill, which is of some interest to electrical supply authorities in the area, is that the Company is authorised to supply power gas within a radius of half a mile from any of its gas works. At present the Company's works are at Brentford and Southall, whilst under the Bill two small companies in Staines and Sunbury are also being acquired with their gas works. It is improbable, however, that the electric supply authorities will be unduly affected by these powers, as it is of interest to note that the Tottenham Gas Co., which obtained similar powers some years ago for a much more industrial district than the Brentford Gas Co. has, does not at present supply a single consumer with power gas, it being admitted that other forms of power so far are well able to hold their own.

**Burnley: Heating and Cooking.**—The charge for electricity for all purposes other than lighting in private houses is to be reduced to 1d. per unit from March quarter.

**Dover: New Lighting Tariff.**—For a certain class of workmen's dwellings the Council has decided to give an unlimited supply of electricity for lighting at 6d. per week per house.

**Dublin: Street Lighting.**—A new system of street lighting by centrally-suspended lamps is being tried experimentally in some of the side streets.

**Galashiels: Electricity Supply.**—The Council has resolved to withdraw its opposition to the provisional order promoted by the Galashiels & District Electric Supply Co., on condition that the proposed charges are slightly modified, and that the Council has the option of purchasing the part of the undertaking within the Borough at shorter periods than forty-two years.

**Glastonbury: Street Lighting.**—The offer of a local company to take over the public lighting of the town on an agreement for ten years at £2 per lamp, has been approved by the Council.

**Leeds: Electric Vehicles.**—A proposal by the Tramways and Electricity Committee to purchase an electrically-driven motor-car for department purposes, mainly as an advertisement of the use of electricity in this direction, has been vetoed by the Council. The proposed expenditure was £600, and the argument that three good petrol cars suitable for the purpose could be purchased for this sum, seemed to have been sufficient to make the Electricity Committee give way.

**London: Bethnal Green.**—The Borough Council has finally agreed to the agreement with the Stepney Borough Council for a bulk supply.

**Hampstead: Electricity Accounts.**—The accounts of the Electricity Department for the year to March 31st, 1913, shows a net profit of £4,985, after meeting interest and sinking-fund charges amounting to £30,000.

**Marylebone: Electric Heating.**—In view of a report by the Medical Officer of Health to the effect that the cost of electric heating is slightly less than that of gas, the Electricity Department are to convert the heating arrangements at Barrett Street convenience from gas to electricity at a cost of £8 17s. 6d.

**St. Pancras: Income Tax Assessment.**—With reference to the note in this column of ELECTRICAL ENGINEERING, Feb. 26th, p. 124, Mr. A. H. Senbrook (General Manager, Marylebone Electric Supply) writes to us stating that the method of assessment referred to is based on negotiations between Mr. Jennings (Secretary and Accountant, Marylebone Electric Supply) and the Inland Revenue Authorities three years ago, and a large number of municipal electrical undertakings have taken advantage of the decision.

**Street Lighting.**—An experimental installation of nine half-watt lamps is to be made.

**Southport: New Tariff.**—The proposed new tariff has been modified by a slight increase in the fixed charges on the rateable value of premises, and the further rate is to be 3d. instead of 3d. per unit.

**Stirling: Electricity and Tramways Undertaking.**—We have reported from time to time with regard to an offer by Mr. George Balfour to purchase the Council's tramways and electricity undertaking, and of the recommendation to the Council not to accept it. Mr. J. A. Robertson, Burgh Electrical Engineer at Greenock, and Mr. Peter Fisher, General Manager of the Dundee Corporation Tramways, who have been advising the Council, have now prepared a supplementary report in which they point out that experience has shown that in nearly all cases it is a mistake to allow important public services to fall into the hands of companies, so far as individual local districts are concerned. This stricture they do not apply to large power companies operating in the areas of many local authorities. The report emphasises the point raised in the previous reports to the Council that it will be unwise to sell the undertaking.

**Stockport: Half-Watt Lamps.**—In view of the recent introduction of the half-watt lamps, the Electricity Committee has deferred considering a reduction in the price of current to long-hour lighting consumers.

**Waterford (Ireland): Electricity Supply.**—The Board of Trade has held an inquiry into the application of the Corporation for a provisional order for the supply of electric light and power.

**Worcester: Rateable Value System.**—The Electricity Committee's recommendation to adopt a rateable value system of charging on the basis of 15 per cent. of the rateable value and 3d. per unit discount, according to the time the account is paid, has been adopted. The use of the maximum demand system is to be abandoned.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**British Insulated & Helsby Cables.**—A final dividend of 9s. per share, making a total of 13 per cent. for the year, is recommended. An increase in profits of £28,956 is reported.

**Folkestone Electricity Supply.**—A final dividend, making 7 per cent. for the year, is to be paid.

**Harrow Electric Light and Power.**—A dividend of 5 per cent. is to be paid on the ordinary shares, in addition to the preference dividend. At the meeting a 14 per cent. increase in output was reported, the figure being now 526,201 units. This included increase in the lighting as well as the heating and cooking load.

**Hove Electric Lighting Co.**—At the meeting of the Company, which was the last before the taking over of the undertaking by the Corporation, a final dividend, making 9 per cent. for the year, was declared.

**London and Suburban Traction Co.**—An issue of £350,000 five per cent. "A" debenture stock is being offered at 92 per cent. This company was incorporated in 1912 to consolidate the interests of the Metropolitan Electric Tramways, the M.E.T. Omnibus Co., and the London United Tramways, and has shares also in the South Metropolitan Electric Tramways and Lighting Co., and the Gearless Motor Omnibus Co.

**Midland Electric Corporation for Power Distribution.**—The revenue during the last year has increased by £10,500, and the year's profit was £38,062. After paying debenture interest and providing for depreciation, £3,573 will be carried forward, but no ordinary dividend will be paid.

**Newcastle Electric Supply Co.**—At the annual meeting it was decided that the undertaking of the County of Durham Electrical Power Distribution Co. be acquired by the Company.

**North Metropolitan Electric Power Supply.**—A dividend of 6 per cent. for the year, with a bonus of 12s. per share, is declared. A further issue of £100,000 6 per cent. cumulative preference stock is being made.

**Oxford Electric Co.**—A dividend at the rate of 7 per cent. on the ordinary shares, and 5 per cent. on the preference shares, is to be paid.

**South Metropolitan Electric Light and Power Co.**—An issue of £25,000 six per cent. cumulative second preference shares is to be made at par. Applications by March 24th.

**The Mirrlees Watson Co.**—A dividend of 5 per cent., with £5,503 carried forward, is recommended. Last year a dividend of 10 per cent. was paid, with a bonus of 5 per cent.

**Vickers.**—After placing £300,000 to reserve, a final dividend of 1s. 6d. per share, making 12½ per cent. for the year, is to be paid. A scheme will be proposed at the meeting to increase the ordinary share capital by £1,110,000, the shares to be offered to existing shareholders at 28s. per share.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 378 [VOL. X., No. 13]

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THURSDAY, MARCH 26, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THERE was a conference between the London Electrical Masters' Association and representatives of the Electrical Trades Union last week; the Union still hold out for a further  $\frac{1}{2}$ d. an hour wages, and object to a clause in the masters' rules to the effect that they should work peaceably with non-union men. The masters are to give their definite decision to-day, but it is unlikely that they will make further concessions; in that event the Union threaten to call out the wiremen on strike. (Page 174.)

An investigation into the fluctuations of candle-power of incandescent lamps on alternating current circuits, shows that by winding the filament into a tight helix, as is done in the "half-watt" lamps, this effect is practically negligible. (Page 175.)

A DISCUSSION on electric vehicles at last Thursday's meeting of the Institution of Electrical Engineers was opened by Mr. F. Ayton. During the evening some details of the electric vehicles used by the London Fire Brigade were given by Lieut. Sladen. (Page 175.)

The design of discharge resistances for use in breaking the circuit of brake magnets is dealt with in our Questions and Answers columns. (Page 176.)

The successful cottage lighting scheme in use at Wednesbury is described by Mr. W. Fennell. The average inclusive charge for the unrestricted use of three lights is 7 $\frac{1}{2}$ d. per week, payable in advance. (Page 177.)

A LETTER refers to the existence of more than one glassworks where lamp bulbs are made in this country. (Page 177.)

A SCHEME of goods traffic by tramway is proposed at Liverpool. (Page 177.)

THE grant of a patent to Westinghouse Metallfaden Glühlampenfabrik for a process of manufacture of ductile tungsten filaments has been refused. The grant of a patent to E. A. Graham and W. J. Ricketts for a system of private telephones has been allowed, although opposed. An important patent relating to submarine telegraphy, by S. G. Brown and A. L. Dearlove expires to-day after a full life. Among the specifications published last week was one by Siemens & Halske dealing with the provision of gases at low pressure in incandescent lamp bulbs, and one by Siemens-Schuckertwerke for an arrangement of coupling-rod drive for rail vehicles. (Page 178.)

THE Marconi magnetic detector has been objected to by the United States authorities as not sufficiently sensitive for ship work. (Page 177.)

SOME new patterns of searchlights and half-watt lamp fittings are described, and a church lighting installation is illustrated in our Trade Section. (Pages 179 to 182.)

AN oil engine generating set is required for Egypt, a condensing pump for Marylebone. Loans have been sanctioned by the Local Government Board at Rochdale and South Shields, and by the L.C.C. at Woolwich. (Page 183.)

A HOUSE of Lords Committee has refused to grant certain extensions to the area of supply at Newport. Electric supply schemes are under consideration at Barry, Colwyn Bay, Connah's Quay, Crowle, and Wye. A profit-sharing scheme is proposed at Hampstead. (Page 184.)

**Foreign Lamps and the L.C.C.**—As reported in our last issue, the Stores and Contracts Committee of the London County Council recommended the acceptance of Pope's Electric Lamp Co.'s tender for metal filament lamps. The specification in question was for lamps with filaments "other than drawn." The Committee's report recommending the acceptance of this has now been withdrawn, in rather peculiar circumstances. It appears that forty-six firms were invited to tender. Pope's Electric Lamp Co.'s tender was not the lowest; there were two tenders lower than this, both for foreign-made lamps. The lowest of these was for lamps which the Committee stated "are not satisfactory." In the case of the second lowest tender (that of the Electric Lamp Supply Co., Ltd.) and the tender of Pope's Electric Lamp Co. the lamps had been tested with satisfactory results, and although Pope's Electric Lamp Co.'s tender was 11 per cent. higher than the other one, it was recommended for acceptance, as the lamps were British-made. An amendment was put down by Mr. Lewis that the tender of the Electric Lamp Supply Co., Ltd., be accepted instead of that for Pope's lamps, but instead of the matter having been debated as it should have been in the ordinary course at Tuesday's meeting of the Council, the Committee's report has been withdrawn, as stated above.

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, MARCH 26TH.

*Institution of Electrical Engineers.*

8 p.m. "Current-limiting Reactances on Large Power Systems," by K. M. Faye-Hansen and J. S. Peck.

*Society of Dyers and Colourists.*

8 p.m. At The Dyers' Hall, Dowgate Hill, E.C. "Illumination in Connection with the Textile Industries," by Leon Gaster.

FRIDAY, MARCH 27TH.

*Physical Society of London.*

5 p.m. At Imperial College of Science, South Kensington. Among the Papers down for reading are "A New Type of Thermogalvanometer," by F. W. Jordan, and "An Experiment with an Incandescent Lamp," by C. W. S. Crawley.

*South-Western Polytechnic Institute.*

8 p.m. Presentation of Prizes and Certificates to Evening and Day Students by the Lord Chelmsford, G.C.M.G. A conversation follows.

*Royal Institution of Great Britain.*

9 p.m. "Improvements in Long Distance Telephony," by Professor J. A. Fleming.

SATURDAY, MARCH 28TH.

*Association of Mining Electrical Engineers: Warwickshire and South Staffordshire Branch.*

5.30 p.m. At Imperial Hotel, Birmingham. Discussion of "Breakdown of a D.C. Motor Armature," by F. Church, and "Electric Winding," by James Gillespie.

MONDAY, MARCH 30TH.

*Royal Society of Arts.*

4.30 p.m. "The Oil Resources of the Empire," by Dr. F. Mollwo Perkin.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College. "Points on the Lay-out of a Static Sub-station." By W. Dixon.

TUESDAY, MARCH 31ST.

*Institution of Electrical Engineers: Manchester Students' Section.*

7.30 p.m. At Manchester Municipal School of Technology, Annual general meeting.

*Institution of Civil Engineers.*

8 p.m. The Paper by T. G. Gribble, "Comparative Economics of Tramways and Railless Electric Traction," will be further discussed.

*Wireless Society of London.*

8 p.m. At Institution of Electrical Engineers. Discussion on Telephone Receivers, to be opened by H. J. Lucas.

WEDNESDAY, APRIL 1ST.

*Dynamicals.*

7 p.m. At Trocadero Restaurant. Anniversary meeting to be followed at 7.30 p.m. by the Anniversary Dinner. Mr. Robert Hammond in the chair.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. "Automatic Pressure Regulators," by A. Arnold and E. L. M. Emtage.

THURSDAY, APRIL 2ND.

*Institution of Electrical Engineers.*

"The Signalling of a Rapid Transit Railway," by H. G. Brown.

### The London Electrical Engineers.

Headquarters (46 Regency Street, S.W.) open Sats. till noon.

Rating Exam. for all Cos. from 7 to 10 p.m. every Wednesday.

Easter Camp will be at Cliffe Fort, near Gravesend, from April 9th (parade at Headquarters at 11 a.m.) till April 18th. Camp cards must be sent in at once.

(TO-DAY) THURSDAY, MARCH 26TH, C. Co. FRIDAY, MARCH 27TH, D. Co. MONDAY, MARCH 30TH, A. Co. TUESDAY, MARCH 31ST, B. Co., Tech. Inst., 7 to 10 p.m. Min. Range, 7 to 9 p.m. WEDNESDAY, APRIL 1ST.—Recruit Instruction, 7 to 10 p.m.

## THREATENED STRIKE OF ELECTRICAL WORKERS

LAST Thursday the members of the London District Committee of the Electrical Trades Union met the London Electrical Masters' Association to discuss with them the new working rules issued by the latter body and published in ELECTRICAL ENGINEERING of March 12th. The men repeated their demand for 11d. an hour wages, objected to the rule to the effect that Union men should work peaceably with non-Union men (the so-called "disability" clause), and also objected to the new grade of pipe-fitter. The masters are considering the men's demands and will give their answer to-day. On Friday there was a meeting of the Electrical Trades Union to hear the report of the deputation, and the following resolution was unanimously adopted:—

"That this mass meeting of London members of the Electrical Trades Union instructs the District Committee and the Execu-

tive Council to await the reply of the employers on Thursday, March 26th, and that the Executive Council immediately write to the London Electrical Masters Association that, unless a favourable reply to their application is received by that date, our London members will cease work; further, that an aggregate meeting be called for the members to give a final decision on the employers' terms before a strike is declared."

It will be seen from the above resolution that the masters were informed that the men would strike unless their demands are agreed to, but on the other hand the men have not yet really definitely determined that they will do so, for there is to be another aggregate meeting of the Union to discuss the employers' terms before a strike is declared. It seems hardly conceivable that the employers will grant further concessions, and we trust, therefore, that the counsels of the more moderate of the workmen will prevail. A strike for a further increase of ½d. an hour when an increase of 1d. has just been granted would be very unwise from the workmen's own point of view, and it would probably result in a large number of the new recruits leaving the Union in disgust. Moreover, unless the Union has become suddenly very rich, it would be suicidal policy to declare war with the masters on the "disability" clause.

Mr. L. G. Tate, Secretary of the London Electrical Masters' Association, has sent the following letter to the Editors of the *Daily Mail*, *Daily Chronicle*, *Daily Express*, *Evening News*, and *Star*:—

The Electrical Trades Union at the end of last year asked for a rise of wages from the recognised rate of 9d. or 9½d. per hour, and the masters at the end of February decided to grant an increase to 10d., dating as and from the first pay-day in April, and 10½d. as and from the first pay-day in July, together with sundry concessions as to travelling expenses and travelling time, but making a proviso that there should be no exception taken either on the part of the men or employers as to the employment of non-union men either in the electrical trade or any other trade with whom the men may be working.

The Electrical Trades Union will not agree to this latter clause, and are threatening a strike if the wages are not increased to 10½d. after the first pay-day in April, and 11d. in July.

I wish to point out to you that at least 75 per cent. of the electrical wiremen are employed throughout the year at a full week's work of 50 to 56 hours, according to the firm with whom they are employed, and taking the rate at even 10½d. an hour on a 53 hour week, their earnings work out at £2 6s. 4½d. per week.

Carpenters and bricklayers, who are now in receipt of 11½d. an hour when working on buildings, can only work 50 hours for 35 weeks, and 44 hours for 17 weeks, as a maximum, and where the weather interferes with them their hours are considerably less. Taking the above hours, however, they can only earn £2 2s. 2d. for 17 weeks in winter, and £2 7s. 11d. for the 35 weeks in the summer (averaging £2 6s. 1d. per week all through the year), so that the electrical wireman at 10½d. an hour is better paid than the carpenter or bricklayer at 11½d.

I think if these facts were realised by the men, and especially by their wives, they would not be in a hurry to jeopardise their jobs for the difference of ½d. per hour, and I appeal to you on behalf of the wives and families of such men to give these facts as full publicity as you possibly can.

At Liverpool the Electrical Trades Union is also active, and it is stated that a large proportion of the wiremen there are members of it. The Liverpool wiring contractors have therefore decided to follow in the footsteps of the London masters in forming an association of electrical employers. At a meeting held last week over 100 were present, and it has been decided to meet again to-day to elect officers and to discuss rules. The standard rate of wages for wiremen in Liverpool is now 9½d. per hour, and the men, it is said, are asking for an increase of 2½d., and a reduction of the working hours from fifty to forty-six and a-half a week. For night shifts they ask one hour less work (or the hour at overtime rate), they demand that the dinner-hour should not be movable, except at overtime rates, an extra 1d. an hour for charge hands, and an extra 1s. a day for "dirty" work.

**The Utilisation of Solar Energy.**—Mr. A. S. E. Ackermann is to read a Paper before the Society of Engineers on the utilisation of solar energy, embodying the results of trials by him of an installation of engines using sun-produced steam. The plant tested has cost some £30,000, the investigations cover nearly four years, and though many experiments with sun power have been made during the last 50 years, this is the first paper of its kind. The meeting is to be held at the Institution of Electrical Engineers on Monday, April 6th, at 7.30 p.m.

## THE FLICKER OF INCANDESCENT LAMPS ON A.C. CIRCUITS

THE question of the flicker of incandescent lamps, with special reference to "half-watt," or nitrogen-filled, incandescent lamps, is dealt with by Dr. Irving Langmuir in the March issue of the *General Electric Review* (Schenectady). The author shows that the flicker which occurs when low-watt incandescent lamps are run on low-frequency A.C. circuits is inversely proportional to the frequency of the A.C. supply, and directly proportional to the power consumption. The introduction of gases into lamps therefore tends to an increase in the fluctuation, since it increases the power consumption at any given temperature. On the other hand, winding the filament into a tight helix tends to a decrease, since it decreases the ratio of power to mass of filament.

The following equation giving the flicker is arrived at:  $F = 20,000 w_0 / f m T^2$ , where  $w_0$  is the heat dissipation from the filament in watts, at the average temperature of the filament,  $f$  is the A.C. frequency,  $m$  is the mass of the filament, and  $T$  is the instantaneous absolute temperature on the centigrade scale. In ordinary tungsten lamps the loss of energy from the filaments is almost entirely by radiation, and, as the power consumption is approximately proportional to the 4.7 power of  $T$ , the candle-power fluctuations increase approximately with the 2.7 power of  $T$ . Where the efficiency is 1 watt per c.p. the filament temperature is about 2,400° C., and the consumption about 0.54 watt for a filament 1 mil in diameter. The mass of this piece is 0.098 mg. By substituting these values the following formula is deduced:  $F = 19.2 / d$ , where  $d$  is the diameter of the filament in mils. This is further reduced to  $F = A / f i$ , where  $A$  is a constant, having a value depending on the efficiency (watts per c.p.) at which the filament is run, and  $i$  is the instantaneous current—the current necessary to maintain a filament at 2,400° C. is 0.197 d<sup>1</sup> amperes, where  $d$  is the filament diameter in mils. At 1 watt per c.p. the value of  $A$  is 6.48, rising to 10.56 at 0.5 watts per c.p. The effect of helically winding the filaments is to decrease the ratio,  $w_0 : m$ , and therefore the candle-power fluctuation, the greatest possible reduction being  $\pi : 1$ . Ordinarily, however, under practical conditions the reduction is about 1.4 : 1. With the filaments in gas, however, the effect is much greater than in a vacuum, for not only the radiated energy, but also the heat carried away from the filament by convection is reduced by its concentration. In general, for a filament of any given diameter in a given gas,  $F$  will be given by an equation of the form  $F = \beta / f$ , where  $\beta$  represents a constant divided by the frequency of supply and the diameter of the filament, and multiplied by the ratio in which the power is increased by the presence of the gas. From this the value of  $\beta$  can be prepared for different conditions, and the results have been tested by direct measurements of instantaneous candle-power. The following tables which have been prepared are of interest as showing how small are the fluctuations in nitrogen-filled lamps:—

FLUCTUATIONS OF C.P. FOR 110-VOLT TUNGSTEN LAMPS WITH EXHAUSTED BULBS.

Watts.	Amperes.	Watts per Candle.	F.		
			25 Cycles.	40 Cycles.	60 Cycles.
10	0.091	1.30	1.08	0.68	0.45
15	0.136	1.25	0.87	0.54	0.36
20	0.182	1.17	0.72	0.45	0.30
25	0.228	1.14	0.64	0.40	0.27
40	0.363	1.10	0.48	0.30	0.20
60	0.545	1.07	0.37	0.23	0.15
100	0.91	1.02	0.27	0.17	0.11
150	1.36	0.90	0.22	0.14	0.09
250	2.27	0.90	0.16	0.10	0.07
500	4.55	0.90	0.10	0.06	0.04

FLUCTUATIONS OF C.P. FOR NITROGEN-FILLED LAMPS WITH HELICAL FILAMENTS.

Amperes.	Watts per Candle.	F.		
		25 Cycles.	40 Cycles.	60 Cycles.
3.0	0.9	0.25	0.15	0.10
5.0	0.7	0.14	0.08	0.06
6.6	0.6	0.11	0.07	0.05
10.0	0.55	0.08	0.05	0.04
20.0	0.40	0.06	0.03	0.02

If the values of  $F$  be multiplied by 100, the result will express the candle-power fluctuation directly in per cent.

## ELECTRIC VEHICLES

THE discussion on "Electric Battery Vehicles," held at last Thursday's meeting of the Institution of Electrical Engineers, was opened by Mr. F. Ayton (Borough Electrical Engineer, Ipswich), who is Secretary of the Electric Vehicle Committee appointed by the Incorporated Municipal Electrical Association, with some very optimistic remarks. He pointed out that great improvements had recently been made in batteries, chassis construction, and tyres, and for inter-urban and suburban work where the mileage limit per charge was not a drawback he saw a great future, especially for the commercial electric vehicle. The lighter cars could generally accomplish fifty to sixty miles on one charge, but by a short boosting during the driver's dinner-hour, the daily run could be appreciably increased. He referred to the large number of electric cars in use in America, and summed up their advantages in steadiness, silence, and freedom from smell; and in considering charging arrangements, spoke of the standard charging plug recommended by his Committee, and suggested that regulation of charging boosters to shut down automatically when the voltage of the battery had risen to the value corresponding to a full charge was desirable. In view of the vested interests in petrol vehicles it was necessary for an active campaign to be carried on by central station engineers and electric vehicle manufacturers.

Mr. J. W. Beauchamp then spoke of the six electric vehicles running at West Ham, where 1d. per unit was charged, and the average revenue to the electricity department was £20 per annum. The movement would be much facilitated if some scheme for hiring out commercial electric vehicles could be started, and he believed that this could be done at a much less cost than with steam lorries. Mr. R. J. Mitchell (Edison Accumulators, Ltd.) thought that 1d. per unit should be the charge for current, and looked upon the electric vehicle as a competitor of the horse rather than the petrol or the steam van.

One of the most interesting speeches was that of Lieut. Sladen, chief of the London Fire Brigade, who gave particulars of the electrically-propelled life-saving appliances adopted as standard by the L.C.C. These had had batteries of 84 cells with a capacity of 200 ampere hours at the 6-hour rate. The total weight of the vehicle, which was driven by gearless hub motors, was 5½ tons complete with men, or about 5 cwt. heavier than a similar petrol vehicle. The contract speed was 25 miles per hour, but this could be exceeded on the level, and a gradient of one in nine could be taken at 15 miles per hour with the circuit-breaker set at 250 amperes. These vehicles cost 1s. per mile to maintain (not including driver's wages, interest, or depreciation), as compared with 1s. 3d. for a similar petrol vehicle. The total annual cost, including depreciation, &c., was about the same for both, or £150, of which £40 was for repairs (including battery renewals) in the case of an electric escape van running 800 miles per annum. The batteries ran 6,000 miles before requiring renewal. There was some difficulty in obtaining a suitable charging voltage from supply authorities. In his experience, for life-saving appliances the electric vehicle was very satisfactory. With a fully-charged battery, it was at its best when starting out, which was not the case with either petrol or steam, and a turn could be made in seven to eight seconds against a minimum of 15 seconds for a petrol vehicle.

Among other speakers, Mr. P. A. Mossay referred to the less wear of tyres caused by electric driving, and showed some views of large fleets of Lloyd electric cars on the Continent. Dr. Porter (Medical Officer of Health, Marylebone) defended the electric car from the hygienic point of view, and Mr. C. Barber expressed the view that for trips under 50 miles electric commercial vehicles cost 20 per cent. less than petrol vehicles. He admitted, however, that most published figures were unreliable. Mr. A. B. Pescatore claimed that an electric chassis, apart from the battery, should last twice as long as a petrol chassis, and put the total working expenses for 2½ to 5 ton vehicles at 14d. to 3½d. per mile. Such figures had been obtained in the Brighton omnibuses, which, he said, consumed 110 to 140 watt-hours per ton mile on hilly routes. Mr. A. Fox said that there was no engineering difficulty in designing a vehicle to run 100 miles on one charge if this was justified economically. Mr. H. Brazil gave some particulars of the control system of a 4½ ton lorry with a 260-ampere-hour battery, which ran at 9½ miles per hour on the level, with a consumption of about 1.3 units per mile. The large number of controller stops, obtained by subdivision of the battery, tended to keep the load factor of the battery high. Mr. Brazil also described the battery discharge meter designed by himself and Mr. F. Lydall, of which details were given in *ELECTRICAL ENGINEERING*, Vol. VIII., page 277.

Some interesting figures of watt-hours per car mile for various sizes of Lloyd electric cars were given by Mr. A. J. Makower as follows:—5 cwt. van, 133; cab, 122; 1½ ton lorry, 80; 2½ ton lorry, 72.4; fire engine, 53.6. He also gave the following costs in pence per car mile for running a service of 100 cabs in a German town. The cabs weighed 2.4 tons, and averaged



90 miles per day each for 350 days in the year :—Battery, 0.99; current, 0.90; tyres, 1.87; driver, 1.56; repairs, 0.71; general, 0.63; depreciation, 0.33. The annual current bill on this system was about £11,500. Other speakers included Mr. A. E. Burgess, who recommended closer co-operation between battery makers and supply authorities, and Mr. W. E. Burnand, who amused the meeting with some experiences with an electric car. Mr. Shrapnell-Smith wound up the discussion with a warning to manufacturers and supply authorities against being too optimistic, and believing that they would begin to make money from the very commencement. As was the case in the steam and petrol car industry, they would have to be prepared to fight very considerable odds for the first few years.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,384.

A small wireless installation has been erected, which is working to a receiving station about a quarter of a mile distant; the signals can be heard with the receiver about two inches away from the ear. It is desired to fit up some sort of calling arrangement to enable the receiving station to be called up. This could take the form of a coherer, but, as this cannot be tuned to a given wave, a relay of some description is preferable so that it can take the place of the telephone when not receiving. Please suggest a suitable form of apparatus.—"CALL."

(Replies must be received not later than first post, Thursday, April 2nd.)

### ANSWERS TO No. 1,382.

A series wound 500-volt 50-h.p. crane motor is fitted with a shunt wound magnetic brake, and this is provided with a discharge coil to take the "kick" when breaking the circuit. State how the necessary resistance and current carrying capacity of the discharge resistance are arrived at, and give the rating of the resistance when working in conjunction with a one-hour rated motor. If the motor is compound wound instead of "series," could the kicking coil be dispensed with?—A. R. T.

The first award (10s.) is made to "BRAKE" for the following reply:—

Assuming that the discharge resistance fitted to this brake magnet is in parallel with it, the resistance would be the same as that of the magnet coils. Thus, supposing the magnet pulls 50 lb. through a stroke of 4 in., it would dissipate 200 watts on a 1-hour rating basis. This allows a maximum current of 0.4 amps. on a 500-volt circuit, and the resistance would therefore be 1,250 ohms. Continuously-rated resistances should certainly be supplied, since the weight of the resistance itself is extremely small compared with that of the magnet, and it soon attains its maximum temperature. Four spirals of resistance wire about 6 in. long and 1 in. diameter would meet the case, and would not allow of a greater temperature rise than 100°C. A discharge resistance would be as necessary with a compound-wound machine as with a series-wound one; but a rather better scheme would be to use a resistance in series with the coils. Most brake magnets are wound with two  $\frac{1}{2}$  coils, and in the case of a 500-volt circuit the coils are connected in series, so that by connecting in parallel we should only put 250 volts

across the coils; the remaining voltage could be absorbed by a resistance of 312 ohms (this being the resistance of two coils in parallel), and capable of carrying 0.8 amps. continuously. This has the effect of making the magnet less sluggish than would be the case with the resistance in parallel, and also the discharge voltage would be lower, as this depends solely upon the flux and the effective number of turns.

The second award (5s.) is made to "L. B.," who writes as follows:—

The h.p., size, or type of motor has no connection with the discharge resistance or the magnet. "Kick" discharge resistances are objectionable, because, on breaking circuit from the line, the self-induction of the shunt magnet winding causes an oscillating current surge (due to the induced E.M.F.) through the closed circuit path of the magnet and discharge. This tends to prevent the brake acting. If the magnet winding is sufficiently well insulated to withstand this inductive "kick," it is therefore preferable to do without the discharge resistance. In some cases this discharge resistance is permanently in parallel with the magnet, with its attendant constant watt loss. Often standard shunt brake magnets are wound in two separate coils, and if so in this case, then by placing the two halves in parallel instead of series, but with a resistance in series to keep the total ampere-turns and watts on coil the same as before, the inductive effect is reduced. Sometimes the whole magnet is designed to withstand the "kick" up to 250-volt circuits without any discharge path, and when used on higher voltages a series resistance is inserted permanently. A compound-wound magnet coil could be successfully used, the series winding being designed to do most of the pull, with the shunt winding to rely upon to hold the brake when operated independent of the varying load on the motor. The total number of turns would thus be so small in comparison with the shunt winding, that the induced E.M.F. on opening circuit would be harmless, and it has the advantage that less watts would be consumed. A copper tube over the plunger also considerably reduces the inductive effect, as the energy is largely dissipated in the closed tube circuit.

The theoretical calculations to determine the inductive rise are extremely involved, especially with a circuit possessing variable permeability.

In its simplest form the inductance  $L = \frac{\phi N}{C \times 10^8}$  in henries, and is numerically equal to the E.M.F. in volts induced by a current changing at a rate of one ampere per second. Therefore this

$$\text{E.M.F.} = L \frac{C}{T}$$

where  $\phi$  = total lines of force,

$N$  = number of turns on winding,

$C$  = current in amperes,

$T$  = time in seconds for this E.M.F. to die down to zero and is unknown.

The current and flux depend, of course, entirely on the induced E.M.F. (For further information see "Solenoids and Electromagnets," by Underhill.) For practical purposes, in this particular case, it is absolutely safe, if the discharge resistance is designed to carry the normal magnetising current for a period of ten seconds without overheating, and with an ohmic value four times that of the magnet winding.

**Association of Supervising Electricians.**—An association of managers, supervising engineers, and permanent foremen attached to the electrical contracting trade has been formed. The objects of the Association are (a) to assist members in obtaining information of situations, (b) to form a technical library for the use of the members, (c) to form a benevolent fund for the assistance of members in distress, (d) to endeavour, by means of lectures and visits to large works, to maintain a high standard of efficiency of all members; (e) to foster the apprentice system for learners in the electrical trade, (f) to endeavour to extend the attendance of electrical workers to evening schools, both technical and practical; (g) to arrange the reading of papers on electrical subjects by members or visitors, invited from other societies, and (h) to arrange periodical social gatherings to promote knowledge and good fellowship amongst members. The subscription to the Association has been fixed at 2s. 6d. per quarter, and the entrance fee at 5s. At the preliminary meeting at which the formation of the Association was decided upon, it was agreed that, in order to become members, foremen or supervising engineers would have to have been employed in the electrical contracting trade a certain time, during part of which they must have been actually acting as foremen or supervisors of work. The Hon. Secretary of the Association is Mr. Charles J. Banister, 14 Pulborough Road, Southfields, S.W., who will be pleased to give full particulars to any intending members.

## COTTAGE LIGHTING

THE lighting of cottages by electricity at a fixed weekly charge was the subject of a Paper, by Mr. W. Fennell, read on March 25th, before the Birmingham Section of the Institution of Electrical Engineers. The scheme described has been tried with great success at Wednesbury. In developing the demand for electricity in the usual way most of the larger houses—these are outside the town—and shops were soon connected. Reduced rates for licensed premises brought almost all these on the mains, and the smaller shops followed when a free-wiring scheme was introduced; but not even this, coupled with a rateable-value system of charge, or slot meters, induced the £8 to £18 householder generally to take a supply. The following scheme, however, enabled the poorer classes, renting cottages at 8s. to 4s. per week, to be reached. The houses are in blocks, and one service will supply from five to fifteen houses. A 7/18 S.W.G. service is terminated in a service fuse in the most convenient house. Space is allowed for fixing a meter. It has been found that the cost of service averages 15s. per house, against the ordinary service cost for a few lights of about £3 8s. Each house is provided with a wall plug socket, which takes the sub-service wire; the plug itself is connected by flexible to a pair of bow cut-outs. From this point the wiring is quite ordinary. The cost of this, with fittings, but without lamps, averages £1 10s. to £1 13s. 6d. per house. A local switch is at present allowed for each light, but the substitution of key-holders is being considered. Whether the extra consumption is of more importance than the reduced cost of wiring is not yet known. Three lamps are supplied: two are 40-watt metal-filament lamps, for the downstairs rooms, and one an 8-c.p. carbon lamp, for the front bedroom. Contrary to expectation, no demand is found for light in the other bedrooms. To prevent any but authorised lamps being used, Edison screw-caps and lamp-holders are adopted. This is quite effective, as lamps with this cap cannot be bought in small quantities, while there is no extra expense for either holder or lamp, because it is the Continental standard. Only the two sizes of lamp are stocked at the works.

It was estimated that an average rental of 7½d. per week would easily cover the cost, as the cost of supply, including all charges, is £7 per kw. of maximum demand, plus 0·35d. per kw.-hour. Owing to the absence of a meter, a certain amount of waste was allowed for, and six hours' use of the maximum demand per night throughout the year was assumed. It was further assumed that the average maximum demand, between 4 and 5.30 p.m., would be 50 watts, but this is higher than has occurred in practice. It has been found that 108 lamps per 100 houses are, on the average, in use between 4.45 and 5.30 p.m. However, later on this is increased, but by that time the power load is off. Based upon a peak-load demand of 45 watts per house, and a six hours' use of this per day, the annual consumption is 100 units. The cost of supply is 5s. 6d. per annum for the standing charges, and 2s. 11d. for the energy consumed, or a total of 8s. 5d. The revenue at 7½d. per week amounts to £1 12s. 6d. per annum. The 7½d. per week average income is obtained as follows:—June and July, 5d.; May and August, 6d.; April and September, 7d.; March and October, 8d.; February and November, 9d.; January and December, 10d.; so that consumers start taking current on a fair basis at any time. Collection is carried out on a commission basis, which has been found to be satisfactory. A collector working insurance or other business is engaged, and he knows how to deal with these consumers. Payment is made in advance on the Monday or Tuesday, and the consumer is liable to be cut off on the Monday following a failure to pay. The scheme has grown from an experimental twenty-five consumers to 250 within eighteen months, without any canvassing or pushing. The price of gas is 1s. 11d. per 1,000 cub. ft. It has also been found that the arrears keep fairly steady, and average about one week's rental. Lamp breakage came out at under one lamp per socket per annum. Not more than 2 per cent. of permanent disconnection has occurred. Even with fairly lenient treatment, bad debts have not exceeded 1 per cent. The sense of fairness existing in the working class, coupled with the weekly visits of the collector, have been found to prevent waste. After paying all charges, a surplus of 15s. 6d. per consumer is obtained. Taking 8s. of this, the entire cost of wiring can be written off in four years. The author concludes:—"A net profit of 7s. 6d. per annum per consumer, or about 25 per cent. of the income, after paying all expenses, is a far better return than can be shown on any other class of consumers. Putting it another way, 1 kw. of maximum demand produces a profit of over £9 per annum,

and over double that sum after three years, while many of the ordinary consumers barely produce a gross income of £9 per kw. of the peak demand."

## CORRESPONDENCE

## STRIKE OF BULB MAKERS.

To the Editor of ELECTRICAL ENGINEERING.

DEAR SIR,—We notice on page 171 of your journal, under the heading "Strike of Osram Bulb Makers," the following words: "At the Lemington Glass Works, near Newcastle, which are connected with the Osram Lamp Works, manufacture the glass bulbs for Osram and Robertson lamps, and are the only works of this character in England, some new machines were introduced a few months ago for opening and closing the moulds into which the bulbs are blown."

We should like to point out that our Glass Works here, where the glass bulbs for Royal Ediswan Lamps are made, are the oldest works of the kind in this country.

Yours faithfully, for the Edison & Swan  
United Electric Light Co., Ltd.,  
C. E. HUNTER (Director).

Ponder's End, Middlesex, March 23rd, 1914.

## ELECTRIC TRACTION NOTES

The Liverpool Tramways Committee is entering into negotiations with the South-West Lancashire Tramway Companies with regard to the inauguration of a tramway goods service between the Liverpool docks and the Lancashire towns of Bolton, Bury, Rochdale, &c. The idea is to inaugurate a small tentative service of tramway wagons with possibly one or two trailers. If successful the scheme would be considerably extended.

The reports of several London tramway companies have been issued. The London United Tramways report a balance of £14,600, after placing £20,000 to renewals, of which £12,500 is recommended to be used for the payment of a 1 per cent. dividend on the preference shares, with the remainder carried forward. The Metropolitan Electric Tramways have an available balance of £52,282, and a dividend of 3 per cent. on the ordinary shares is recommended in addition to the preference dividend. The London and Suburban Traction Co., which holds shares in the above and other London traction concerns, including motor-bus undertakings, reports a balance of £88,252, and pays a 5 per cent. dividend on the preferred shares only.

**Society for Electrical Development.**—Recently an organisation called the "Society for Electrical Development," was brought into being in the United States. The objects are general, co-operative, public educational work, but it was decided that, before a start was made, a fund of \$200,000 (£41,500), should be subscribed. This amount was reached a few weeks ago, and on March 1st the Society took in hand the task of educating the public to "do it electrically." A national advertising campaign will probably be started at a near date. According to the *Electrical World* (New York), the membership on February 26th was 1,300, apportioned as follows: Central stations, 279; manufacturers, 173; contractors, 568; jobbers, 262; and miscellaneous, 18.

**Association of Engineers-in-Charge.**—The nineteenth Annual Dinner of this Association was held on Saturday at the Holborn Restaurant, and about 300 members and guests were present. Dr. R. T. Glazebrook, C.B., F.R.S., the President, was in the Chair. The toast of Science, Practice, and Technology was proposed by Mr. A. B. Raworth, and responded to by Sir Alfred Keogh, K.C.B. Mr. E. Penn, the Hon. Secretary of the Association, gave the health of the guests and kindred institutions, to which Mr. Leslie T. Robertson and Sir Thomas Pile, Bart., replied. Finally, the Association was proposed by Sir Boverton Redwood, Bart., and responded to by Dr. Glazebrook.

**U.S. Naval Collier "Jupiter."**—The trials of this vessel have just been completed off the Lower Californian Coast. An average speed of 15·1 knots was maintained for 48 hours, says the *Electrical Review* and *Western Electrician* (Chicago). The propeller speed was 115·7 r.p.m., and 6,940 h.p. was there developed. This performance is said to exceed that of the similar ships *Cyclops* and *Neptune*. The former is fitted with reciprocating engines, and the latter with geared turbines. The equipment of the *Jupiter* was described in ELECTRICAL ENGINEERING for August 29th, 1912, page 481, and has been referred to from time to time.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published March 19th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

*Names in italics indicate communicators of inventions from abroad.*

1,775/13. **Negative Arc Lamp Carbons.** H. AYRTON. A central core of hard carbon is surrounded by a shell, burning more easily. A closely adhering copper coating is provided. Three figures.

5,763/13. **Governing Speed of Engines at Sea.** A. W. FITHIAN. By means of a gravity controlled rheostat an electromagnet, whose core is attached to the moving part of a balanced throttle valve, gradually, by the motion of the ship, controls the valve. One figure.

14,380/13. **Dynamo and Motor Windings.** SIEMENS DYNAMO WORKS (*Siemens Schuckertwerke-Ges.*). Stranded conductors are reinforced by a bar, sheath, or some of the strands sweated together. Nine figures.

15,284/13. **Dischargers for Wireless.** W. J. MELLERSH-JACKSON (*Signal-Ges., Germany*). Condensers are charged and discharged by arranging the regularity of the discharge spark in correspondence with successive single alternations, or groups, of the A.C. current by inserting in the charging circuit an inductance, the value of which varies in synchronism with the alternations. One figure.

17,416/13. **Incandescent Lamps.** SIEMENS & HALSKE A.-G. Where a chemical compound is used in the bulb for the purpose of giving off gas, this is arranged to be heated by a special wire in series or parallel with the filament, e.g., it may be wound round a tube containing the compound. The wire is of such material that its cross-section decreases with time and therefore runs hotter, thus tending to maintain the quantity of gas evolved constant as the amount of the chemical left decreases.

19,517/13. **Polyphase Commutator Motors.** E. F. W. ALEXANDERSON. A standard drum compensating winding is connected in series with one of the supply leads. The arrangement is useful in connection with the speed control of an induction motor by a commutator motor in cascade. One figure.

27,472/13. **Locomotives.** SIEMENS SCHUCKERTWERKE-GES. A motor or jackshaft is situated between two pairs of coupled driving wheels, and with its centre line above that of the driving wheels. Lugs at the ends of the coupling rods are connected to cranks on the motor or jackshaft by coupling rods parallel to the other coupling rods. One figure.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SMITH and GARNETT [Cables] 7,311/13.

**Dynamos, Motors, and Transformers:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Regulation] 30,107/12; BRAIN and LEECH [Insulating tanks for transformers] 8,591/13.

**Electrometallurgy and Electrochemistry:** TISCHENKO and PLAUSON [Conversion of carbon into liquid hydro-carbons] 27,430/12; JONES [Welding] 27,496/12; BUCHER [Fixation of nitrogen] 27,713/12; [Alkali metals] 139/13; MIES [Treatment of plants, &c.] 11,997/13; AUGUST SCHWARZ [Carbon electrode holders] 24,900/13.

**Heating and Cooking:** DALTON [Sad-irons] 12,246/13.

**Instruments and Meters:** SIEMENS BROS. (*Siemens & Halske A.-G.*) [Recording mechanism] 17,266/13.

**Storage Batteries:** DAVIES, 28,086/12; WORSNOP [Boxes] 15,411/13.

**Switchgear:** MORRISON [Motor controllers] 5,792/13; A.E.G. [Liquid-immersed switch] 10,077/13.

**Telephony and Telegraphy:** SIEMENS BROS. & Co. (*Siemens & Halske A.-G.*) [Selectors] 2,409/13; AUTO. TEL. MFG. Co. (*Auto. Elec. Co., U.S.A.*) [Impulse transmitters] 5,249/13; WESTERN ELEC. Co. (*Western Elec. Co., U.S.A.*) [Telephone exchanges] 5,654/13; STELJES & REBERT [Telegraph transmitters] 5,805/13; WESTERN ELEC. Co. (*Woodward*) [Power control for automatic switches] 20,591/13; LEE and HOGAN [Wireless] 24,458/13.

**Traction:** CLARK [Automatic wireless train control] 4,901/13; ALEXANDER (*Union Switch & Signal Co., U.S.A.*) [Group control of signals and points] 5,295/13; CROMPTON & Co. and BURGE [Regenerative control] 6,806/13; W. R. SYKES INTERLOCKING SIGNAL Co. and TARRANT [Locking mechanism] 8,153/13; SIEMENS DYNAMOS WORKS and DUKE [Automatic train control by separately actuated contactors] 8,624/13; DUPLOCK [Railway signalling] 21,967/13.

**Miscellaneous:** AHLEMEYER [Automobile movement indicator] 4,664/13; WHITE and GARDNER [Indicators for steam trains] 8,273/13; STRANGE and NEW BRIT. EVER READY Co. [Floral

decorations] 12,728/13; HITZELBERGER and NEW BRIT. EVER READY Co. [Lamps] 14,423/13; MASCH. OERLIKON [Oscillating motion produced electro-magnetically] 15,059/13; ELPHINSTONE [Ships' telegraphs] 15,556/13; LOWE [Battery regulators] 18,164/13; FILLERSDOBF [Alarm clock] 27,541/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems:** SHAW, 5,247/14.

**Dynamos, Motors, and Transformers:** A.-G. BROWN, BOVERI [Cooling] 14,941/13; HARTMANN [Maintaining vacuum in metal vapour rectifiers] 2,288/14.

**Ignition:** POHL E. & SIAL, 20,800/13; SPADA [Sparking plugs] 29,059/13.

**Switchgear, Fuses and Fittings:** CHAPMAN [Plug] 25,675/13; KEMP and LAURITZEN [Relays] 29,448/13; KREIDLER [Lamp-holders] 2,079/14; JESSEN [Throw-over switches] 4,447/14; AKTIEBOLAGET LUX [Flash lighting] 4,473/14 and 4,920/14; POLLAK [Interrupters] 5,070/14.

**Telephony and Telegraphy:** LAVERY [Telephony] 4,619/14; POLYPHOS ELEKTRIZITATS GES. [Wireless] 4,664/14; SHAW [Telephony] 5,246/14.

**Miscellaneous:** SENDLER [Pocket lamp with writing attachment] 16,742/13; H. ARON ELEKTRIZITÄTS ZÄHLERFABRIK GES. [Clocks] 26,631/13.

The following Amended Specifications may now be obtained:—

**Miscellaneous:** P. R. KEPPE and H. M. R. MADDOCK [Shaft rotation indicators] 3,878/12; J. C. CLARKE and CHADBURN'S (SHIP) TELEGRAPH Co. [Shaft rotation indicators] 9,673/12.

### Grant of Patents Allowed

8,040/12. **Variable-Speed Dynamos.** C. A. VANDERVELL and A. H. MIDGLEY. The Law Officer has, on Appeal, upheld the Grant of this Patent.

2,610/13. **Private Telephone System.** E. A. GRAHAM and W. J. RICKETTS. The Comptroller has decided that the Grant of this Patent, though opposed, be allowed.

### Grant of Patent Refused

3,162/13. **Ductile Tungsten Filaments.** WESTINGHOUSE METALLFADEN GLÜHLAMPENFABRIK. The Grant of this Patent, which was opposed by Siemens Bros. & Co. (ELECTRICAL ENGINEERING, Nov. 13th, 1913, p. 627), has been refused by the Comptroller.

### Opposition Entered to Grant of Patent

1,862/13. **Earthing Clip.** F. TOWNSON. A construction for an earthing clip to fit different sizes of cables and conduits is given.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

5,649 of March 26th, 1900. **Submarine Telegraphy.** S. G. BROWN and A. L. DEARLOVE. To facilitate relay working, the condensers in series with the relay are shunted by a high resistance. A main relay coil is attached to a heavy, damped auxiliary coil, adjusted to compensate automatically for any movement of the main coil caused by polarising of the condensers. For duplex working, a closed iron circuit transformer is connected across the arms of the bridge in place of the condensers.

6,034 of March 31st, 1900. **Automatic Fire Alarms.** G. H. OTTAWAY (*C. E. May, New Zealand*). A slack sagging strip or wire is so arranged that a gradual rise in temperature is compensated for by the supports, but a sudden rise causes a local circuit to be closed.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distribution Systems:** P. M. LINCOLN [Regulation of A.C. loads by a battery equipment] 25,967/07.

**Dynamos and Transformers:** W. SCHÄFFER [Rotary Converters] 26,762/07.

**Switchgear, Fuses and Fittings:** C. DE KANDÓ [Control of liquid resistances by compressed air] 26,966/02; J. Y. JOHNSON (*Elek. A.-G. vorm W. Lahmeyer & Co., Germany*) [Oil immersed fuse for high pressures] 26,380/03; A. J. BARLOW [Motor controllers] 12,508/08; C. H. PUGH, LTD., and G. F. BULL [Junction boxes] 26,252/08.

**Traction:** JOHNSON-LUNDELL ELEC. TRACTION Co. (*R. Lundell, U.S.A.*) [Series-parallel control; improvement in specification No. 7,979/99] 26,668/02; M. O. SPICKNALL and J. G. WHITE & Co. [Tramway track rail and conduit point tongues] 27,728/06.

**Miscellaneous:** T. HARDEN and AMALGALINE, LTD. [Aluminium solder] 26,932/07; F. MITCHELL [Indicating targets] 26,059/08; H. WANDREY [Bell indicators] 26,502/08.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The Washington Bureau of Navigation issued the following sweeping order to its wireless inspectors recently, according to the *Financier* on February 14th:—"A large number of range tests conducted by revenue cutters has conclusively demonstrated that the Marconi magnetic detector is not efficient under the Act of July 23rd, 1912. The tests have proved that signals are unreadable on the magnetic detector at a distance of 100 miles when the transmitter is of the usual 10-in. coil battery type and average ship antennas are employed. Masters and owners of vessels equipped with magnetic detectors only should be notified in writing of these facts, and should take steps promptly to secure satisfactory detectors. Instructions regarding reporting of violations in these cases will be forwarded later." Naturally this is not regarded with favour by the Marconi International Marine Communication Co. and the British Post Office. We understand also that the Foreign Office is taking up the matter. The International Co. has issued orders to commanders of all west-bound vessels for range tests at distances above 100 miles to be made, and the Manager of the International

Co. has started for Washington. The magnetic detector is known not to be the most sensitive, but is still, by most people, regarded as the most constant. It should be used in connection with the Marconi multiple tuner and a suitable aerial, and if these conditions were not fulfilled in the tests carried out by the U.S. revenue cutters, its true range and sensitiveness were not found. The tests now being made by actual cargo and passenger vessels will show what their range really is. It will be remembered that the Marconi Co. fits both the magnetic detector and the Fleming valve on most of its ship sets. We referred to this practice in *ELECTRICAL ENGINEERING* for June 27th, 1912, p. 364, Vol. VIII.

Although most of the large provincial towns have telephone advisory committees, London has not until recently had one. The London Chamber of Commerce has, however, now appointed a special committee to study the working of telephones in London, and take up the question of subscribers' grievances. On the committee are representatives of the City Corporation, L.C.C., Port of London Authority, and other bodies.

The Zanzibar-Mombasa cable was down for a short while on March 21st, and the Persian line between Borazjoon and Ahvaz was restored on the 18th inst.—The Post Office gave notice last Thursday of serious delay in telegrams to and from France owing to cable interruptions.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 183. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**HALF-WATT LAMPS AND FITTINGS.**—Drake & Gorham, Ltd. (1 Felix Street, Westminster Bridge Road, S.E.), has just issued a list dealing with half-watt lamps, lanterns, and fittings. The company stocks, Osram, Mazda, Wotan, Ediswan, and Nitra lamps for 50 to 260 volts and 300 to 1,500 watts. There is also listed a full range of watertight lanterns in different styles and designs. Holophane glassware, and indirect and semi-indirect lighting fittings, are also shown in profusion.

**TRANSFORMERS.**—Another pamphlet from the same company deals with air-cooled 2,200-volt transformers, with oil-filled transformers up to 650 volts, and with air-cooled house transformers up to 250 volts.

**GRINDING AND DRILLING MACHINES.**—A further list deals with electric grinding and drilling machines which are made for D.C. (compound-wound motors) or three-phase A.C. The smaller machines are made either on grinders or drills, or the two may be combined. The machines are neat and form most handy tools. Holes can be drilled up to  $\frac{1}{4}$  in. or 2 in. in diameter, according to the size of machine. The little grinders are light in weight, and can be obtained for bench or lathe work.

**ILLUMINATING MATERIAL.**—A recently issued sectional list sent us by the Electrical Co., Ltd. (122-124 Charing Cross Road, W.C.), prices "Striplite" for outdoor illuminations, such as piers, promenades, bandstands, &c., as well as for indoor and temporary outdoor illuminations. It is also useful for the illumination of lawns. Decorative flexible chains for indoor illuminations of different kinds, using Edison screw lamps or candle lamps, are also dealt with.

**EDISWAN ABRIDGED CATALOGUE.**—An abridged catalogue of "Royal Ediswan" lamps, accessories, cables, wires, conduits, brackets, ship and Majolica fittings, shades, instruments, fans, radiators, indicators, bells, pushes, telephones, signs, and carbons has just been issued by Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex). Many specialities, falling under the above heads, which have been in use by the trade for many years, are included, as are the most recent productions of the firm. Among the lamp section attention may be directed to the "Royal Ediswan" drawn-wire traction lamps. These have short and rigid filaments, and are made in 100- and 130-volt sizes for 20 and 30 watts. They are 4 in. in length and  $2\frac{1}{4}$  in. in diameter. The new "Downlite" lamp for all pressures from 35 to 260 volts, and for 30 to 60 watts, is also listed. Admiralty pattern watertight sockets and plugs, and watertight switches, are included. We may also refer to the well-known "Phlatta" type switches, to the Home Office pattern hand-lamps, and to the new Ediswan glassware known as "Ultralux."

### CHURCH LIGHTING

THE suitable lighting of churches is a subject with special features of its own, and to secure a restful but efficient and worthy illumination requires careful thought in the



FIG. 1.—ELECTRIC LIGHTING AT ST. ANDREW'S, PLAISTOW

arrangement of the lights. The British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.) have given the matter a good deal of attention, and have obtained some fine




FIG. 2.—FORMER GAS LIGHTING AT THE SAME CHURCH.

results by the use of Mazda lamps and their special reflectors. A good example of this is the installation recently designed by them and carried out at St. Andrew's, Plaistow, which was formerly lighted by gas. The new installation in



# A LETTER of INTEREST

Please address all communications to "Electricity Works, Maidstone."

	<p><b>Borough of Maidstone</b> <b>Electricity Supply.</b></p> <p>S. E. HOADLEY, M.I.E.E. Engineer and Manager</p>	<p>Telephone: Exchange: Wells. 41 Engineer: Hoadley U6</p>
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Your Ref:  En  Our Ref: EKH/SB

January 23rd., 1914.

Messrs Drake & Gorham Ltd.,  
1 Felix Street,  
Westminster Bridge Road,  
L O N D O N. S.E.

Gentlemen,

I send you herewith particulars as to our Osram lamps for the year ending December 31st.. 1913.

Description of lamp used..... 230 volt 55 watt.  
Declared pressure..... 230 volts.  
Number of lamps failed during year 761.  
Total hours life .....1,953,219.  
Average life per lamp.....2,566. hours.

Yours faithfully,  
*E. E. Hoadley*

**We can give AN IMMEDIATE  
DELIVERY of OSRAM LAMPS**  
*All Types kept in Stock.*

## DRAKE & GORHAM, Ltd

Telegrams:  
"DRACORLITE," LAMB, LONDON.  
"ACCUMULATOR,"  
MANCHESTER or GLASGOW.  
"SWIFTSURE," LIVERPOOL.

LONDON : 1, Felix Street.  
MANCHESTER : 47, Spring Gardens.  
GLASGOW : 50, Wellington Street.  
LIVERPOOL : 37, School Lane.

Telephones:  
4338 Hop (2 lines).  
3700 Manchester (2 lines).  
3858 Corporation and  
2198 Argyle, Glasgow.  
754 Royal, Liverpool.

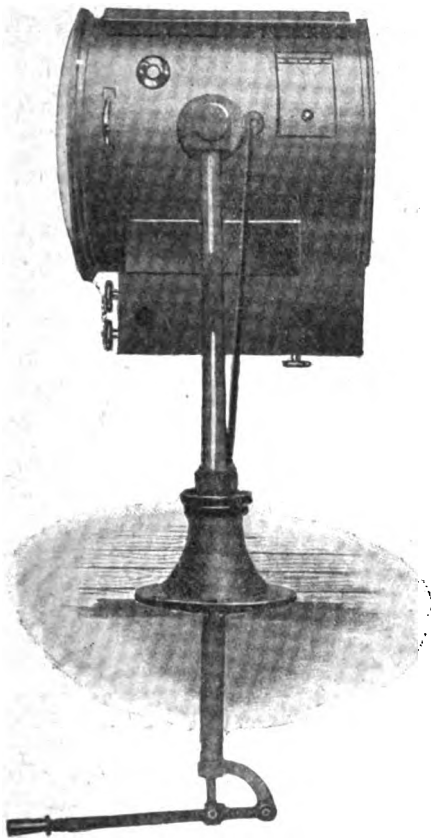
the body of the church consists of Corona fittings equipped with Mazda lamps and Opalux glass reflectors. The altar is lighted by means of Mazda lamps in B.T.-H. Mirolux silvered-glass trough reflectors, arranged to project the whole of their light on to the beautiful reredos, while the light units themselves are invisible. Apart from the increased effectiveness of the new installation in enabling the beauty of the altar and of the whole interior of the church to be seen to better advantage, the illumination is more comfortable and agreeable to the congregation than the old gas lighting. By using efficient Opalux reflectors it has been possible to raise the light units above the line of vision without any sacrifice of illumination at eye-level. And, moreover, the Opalux reflectors screen the brilliant lamps and diffuse the light, distributing it with a soft and restful radiance.

The fine effect produced is seen in Fig. 1, and the comparison with Fig. 2, which shows the old gas lighting, is very striking.

### SEARCHLIGHTS

THE accompanying illustration depicts one of many patterns of searchlight projector made by the London Electric Firm (George Street, Croydon).

In addition to the ordinary naval, mercantile, canal, and cinema types, this firm is equipped for making searchlights for any and every purpose, including motor-operated revolving patterns for advertisement purposes, and some fitted in specially made "lighthouses." Locomotive headlight equipments are also supplied. All kinds of mirrors can be furnished

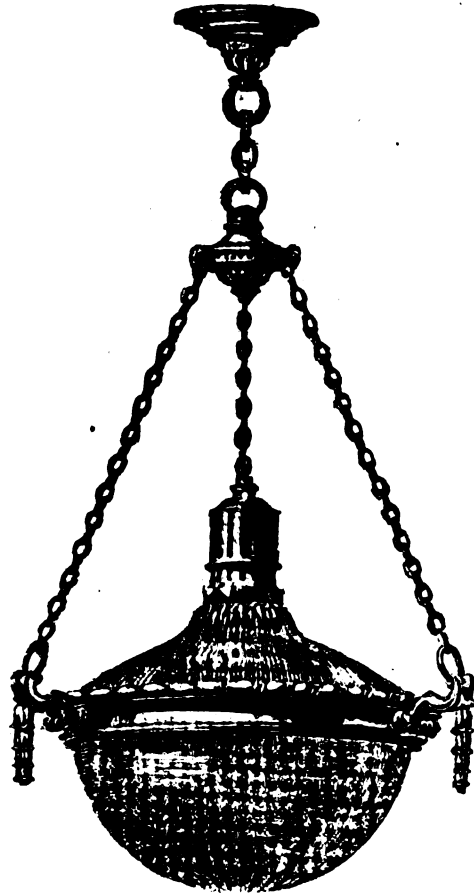


PILOT HOUSE PATTERN OF SEARCHLIGHT.

with this apparatus, including best quality parabolic and patent split mirrors, which are becoming very popular now by reason of their simplicity and high efficiency; also "Mangin" mirrors, and all kinds of the metal variety. The lamps are of various patterns, including combined automatic and hand feed, evolved from long experience. The lenses include dispersing and dark interval types, for double, flat, or oval beams, and for "all-round" dispersion. The Suez and Panama types are made to conform with the Canal Authorities' requirements. In addition to the ordinary enamel finish, the projectors are also made with brass and nickel-plated bodies, suitable for yachts and pleasure steamers. The firm also supply special generating plant for searchlight work.

### HOLOPHANE HALF-WATT LAMP FITTINGS

THE GENERAL ELECTRIC Co., Ltd. (87 Queen Victoria Street, E.C.), has now issued a supplement to its recent price-list of fittings for half-watt lamps. This additional leaflet illustrates four new fittings entitled "Marquis," "Earl," "Noble," and "Peer," which are designed to harmonise with



HALF-WATT HOLOPHANE FITTING.

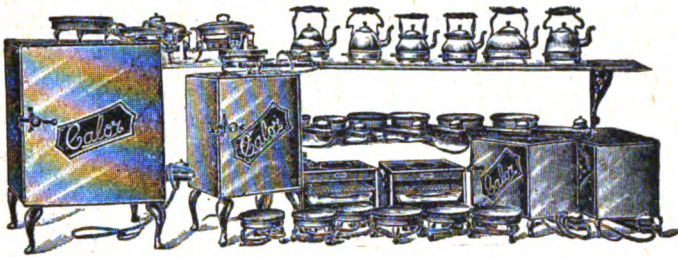
Holophane glassware. Each is listed in two sizes, so that the diameter of the glass is either 14 in. or 16 in., and the half-watt Osram lamps recommended are 300-500 watts and 500-1,000 watts respectively. The Company will be pleased to forward both list and supplement to all interested, on application to its head office or one of its provincial branches.

"Osram" and "Robertson" Staff Dinner.—The annual dinner of the "Osram" and "Robertson" Electric Lamp Works held at the Clarendon Restaurant, Hammersmith, on Monday evening, under the chairmanship of Mr. C. Wilson (Manager, Osram Lamp Works), was, if possible, even more enjoyable than similar gatherings of previous years. There were present about 140 members of the staffs of the "Osram" and "Robertson" Works, and visitors, the latter including the Mayor of Hammersmith, several Councillors, practically all the Electricity Committee, and Mr. G. G. Bell, Borough Electrical Engineer. After the toast of "The King and Royal Family" had been honoured, the chairman proposed "The Allied Firms." In the course of his remarks on the treatment received from the directors, he mentioned that during the past year their sick fund had collapsed, owing, he believed, to malingering under the Insurance Act, and the directors had decided to set aside a sum for the benefit of those of the "Osram" and "Robertson" staffs who were in need of assistance. He referred also to the great growth of the works during the last few years. Mr. Hugo Hirst made a pleasing reply to the toast, and Mr. F. P. Driver proposed "Our Visitors and the Press." This was responded to by the Mayor of Hammersmith, Mr. Jas. Fletcher, and Mr. S. Rentell. The final toast of "The Chairman" was proposed in a few suitable words by Mr. P. Pring, and briefly replied to. A varied programme of mirth and song, largely carried out by members of the staff of the Lamp Works, proved most enjoyable, and was much appreciated by the audience. From start to finish the dinner appeared to be a great success for all concerned.



## ELECTRIC COOKING APPARATUS

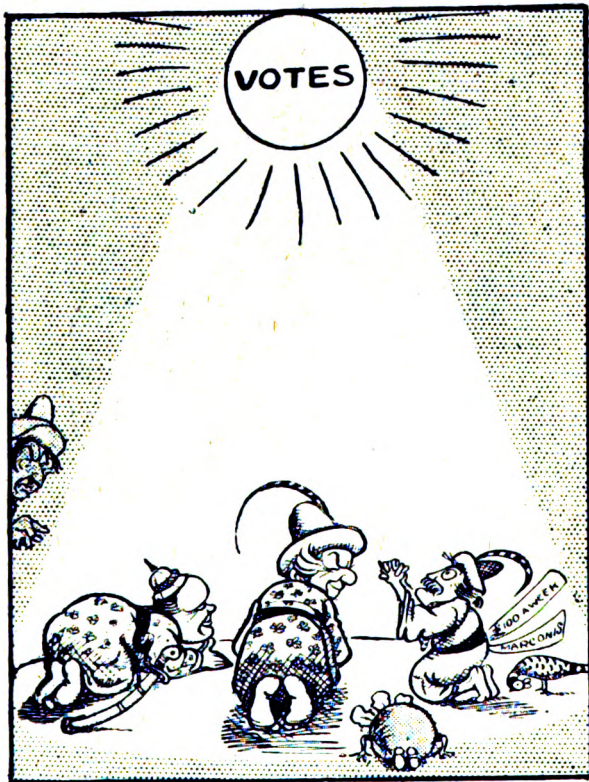
THE illustration given here represents one-seventh part of an order for Calor electric cooking apparatus, which is being executed by Townshend's Art Metal Co., Ltd., Birmingham.



ELECTRIC COOKERS, &amp;C., FOR SOUTH AMERICA.

ham, for South America. As will be seen, there are four ovens of various sizes, two grillers, and a large number of hot-plates, kettles, and other individually heated appliances.

**Sun Worshippers.**—We are informed that the Publicity Department of the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), had a busy day on Monday



THE VOTE WORSHIPPERS.

of last week, which was quite unconsciously caused by the *Daily Express* forming its cartoon on the same design as the Company's famous poster "Sun Worship." It is hoped that political feeling will not in any way be offended by the reproduction of this cartoon.

**Annual Dinner.**—The directors of Electrical Installations, Ltd., entertained some 100 members of the staff and guests at their seventh annual dinner, held last Saturday at the Hotel de l'Europe, Leicester Square. The dinner was followed by a musical entertainment. Mr. H. F. Simon, in the chair, spoke on the labour unrest in the electrical contracting industry, and speeches were made by several other gentlemen.

**MARRYAT & PLACE**  
DYNAMO & MOTOR HOSPITAL,  
**ARMATURE REPAIRS**  
28, HATTON GATE, LONDON, E.C.

## The Perfect Hose Covering

must be strong, flexible, elastic, rust-resisting, durable and of the pattern best adapted to the special requirements of any particular job.

## "PRANA" PLAITED METALLIC

## (non-rusting) HOSE COVERING

fulfils all these requirements and is also of excellent appearance and

## VERY MODERATE IN PRICE.

- 1. Made in a great variety of patterns in steel and brass wire, flat lattice pattern, &c., &c.
- 2. Specially designed for covering Flex.
- 3. Insulates against heat—protects from fire. Indispensable for Chandeliers, Irons, &c., &c.

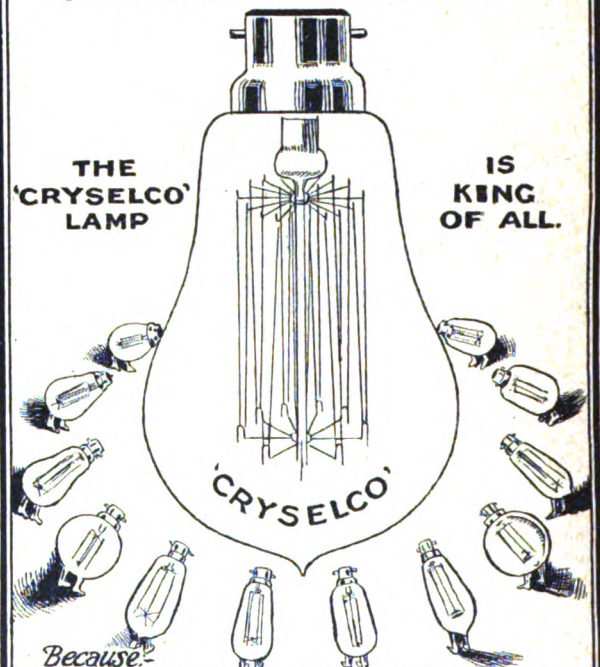
1. Send for descriptive illustrated Price List.

## AERATORS LIMITED

(Dept. E R.) Upper Edmonton, London, N.

## ALL OTHERS BOW BEFORE

## The 'CRYSELCO' METAL FILAMENT LAMP.



Because

IT NOT ONLY SAVES 3/4 OF YOUR CURRENT BILL BUT IS STRONGER, BRIGHTER, & MORE DURABLE THAN ANY OTHER.

James Macintyre & Co. Ltd.

Manufacturers of

PORCELAIN

**INSULATORS**

of every description

Washington Works, Burslem.

LOWERING GEAR FOR ARC & METAL FILAMENT LAMPS ELECTROLIERS ETC.  
**IN STOCK**  
THE LONDON ELECTRIC FIRM, CROYDON.  
**IN STOCK**  
WINCHES FOR ARC LAMPS AND GENERAL LIFTING PURPOSES



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Egypt.**—Tenders are invited by April 8th for a 45-kw. crude oil generating set, switchboard, auxiliaries, electric pumps, motors, gearing, cable, &c., for Khanka Sewage Farm. Controller-General Main Drainage Department, Cairo. Deposit, £3 1s. 7d., not returnable.

**Hornsey.**—Application is to be made to the Local Government Board for a loan of £13,744 for a new sub-station at Muswell Hill.

**Kettering.**—The Local Government Board has sanctioned a loan of £12,000 for electricity works extensions.

**London: Hackney.**—Further extensions of the generating station, including a 5,000-kw. turbo-alternator with condensing plant, switchgear, &c., at a cost of £15,750, have been decided upon.

**Marylebone.**—Tenders are to be invited for a new canal condensing-pump motor and equipment.

**Woolwich.**—The following loans have been sanctioned by the London County Council:—£934 and £1,200 for mains; £907 for transformers and switchgear; £880 for house services; £740 for meters; and £4,460 for electrical apparatus to be supplied on the hire system.

**Lurgan.**—An inquiry into an application for a loan for the establishment of a municipal electric lighting scheme is to be heard on Monday next.

**North Skelton.**—A Local Government Board inquiry is to be held on Friday into an application for a loan for an electric lighting scheme.

**Rochdale.**—The Local Government Board has sanctioned a loan of £65,000 for extensions to the electricity works.

**South Shields.**—The Local Government Board has sanctioned loans of £7,039 for generating plant, £2,913 for converting plant, and £4,571 for water-tube boilers and economisers.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdeen.**—Children's hospital, Ashley.

**Ashton-under-Lyne.**—Elementary school, Mossley Road.

**Baffling.**—Public hall.

**Bradford.**—Tenders are invited for an electrical installation at the School for the Blind, Odsal House. Director of Education, Town Hall. March 28th.

**Birmingham.**—New theatre on site of Curzon House, Suffolk Street.

**Brierfield.**—New picture palace. Smith Bros., Quaker Bridge, Brierfield.

**Douglas (Isle of Man).**—Secondary school.

**Gloucester.**—New theatre in Westgate Street.

**Gourock.**—New police station, &c., Shore Street.

**London.**—Extensions to Tooting Bec Asylum. Metropolitan Asylums Board.

**Salford.**—Territorial headquarters. Surveyor East Lancs. Association T.F. Town Hall Chambers, Ashton-under-Lyne.

**Skegness.**—New picture theatre and vaudeville house.

**Swindon.**—Elementary school for Ferndale Road district.

**Watford.**—Enlargement of infirmary.

**Willesden.**—Secondary school.

### Miscellaneous

**Manchester.**—Tenders for a twelve months' supply of signal, telegraph, and electric light fittings, and wires, are required by the Lancashire & Yorkshire Railway, March 30th. Mr. Waring, Stores Department, Osborne Street.

## TENDERS RECEIVED AND ACCEPTED

**London: Hackney.**—Time-limit devices to add to the circuit-breakers at the station are to be purchased from G. Ellison.

**Islington.**—Venner & Co. have obtained a contract for the supply of Chamberlain & Hookham A.C. meters.

**L.C.C.**—The tender of Arthur Newman, Ltd., for wiring the Belsize fire-station (£155 10s.), has been accepted.

**L.C.C. Tramways.**—In addition to having carried out the rewinding of seventeen 300-kw. motor-generators, Messrs. Newton Bros., of Derby, are to add further field coils to these machines, at a cost of £685, which will enable their output to be increased to 400 kw.

**Marylebone.**—The tender of the British Westinghouse Co. for a rotary-converter, &c. (£3,202), is recommended for acceptance, subject to the consent of the Local Government Board to the loan.

**Southampton.**—Siemens Bros. Dynamo Works, Ltd., have obtained a contract for the annual supply of electrical stores.

**Southend.**—The tender of Belliss & Morcom for five Diesel engines for new substations at Leigh and Thorpe Bay (£14,510) is recommended for acceptance, subject to the consent of the Local Government Board to the loan.

**Swansea.**—The tender of Callender's for cables (£12,007) has been accepted.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £66 15s. to £67 5s. (Last week, £65 10s. to £66.)

**Bankruptcies, Liquidations, &c.**—Tom Murray Woodcock, Electrical Engineer, 64 Holly Street, Sheffield, has been adjudicated bankrupt.

At the meeting of creditors in the liquidation of the Stolz Electrophone Co. (1913), Ltd., the Official Receiver said that there had been a good deal of irregularity in the company's affairs, and he had been unable to find the whereabouts of Mr. Holt, the promoter and managing director. The Official Receiver (Mr. H. E. Burgess) was appointed liquidator with a committee of inspection of three creditors and one shareholder.

**Canadian Agency.**—Two English engineers in Toronto, says the *Board of Trade Journal*, wish to represent United Kingdom manufacturers of electrical supplies. Imperial Trade Correspondent, P.O. Box 176, Toronto.

**Change of Telephone Number.**—Electrical Installations, Ltd. (27 Martin's Lane, Cannon Street), advise us that their telephone number is now City 3897 (3 lines).

**Companies Struck off Register.**—The following have been struck off the register of joint stock companies:—British Electrics (Moseley's Patents), Ltd.; Ecco Battery & Electrical Co., Ltd.; Electromuse, Ltd.; Hunslet Electrical Pottery Co., Ltd.; Madeira Electric Lighting Co., Ltd.; Mutual Electricity Supply Co., Ltd.; Premier Electric Lamp Co., Ltd.; "Simplex" Arc Lamp Syndicate, Ltd.; Westminster Automatic Telephone Syndicate, Ltd.

## APPOINTMENTS AND PERSONAL NOTES

Mr. H. Richardson (City Electrical Engineer, Dundee) has been recommended, out of a list of sixty-nine candidates, for the post of Electrical Engineer to the Salford Corporation, at a salary of £1,000 per annum. At a meeting, however, of the Dundee Council it was decided to offer him an increase from his present salary of £650 to £800 per annum, with further annual increases of £50 up to £1,000, if he would stay at Dundee.

Mr. J. A. Tomlinson has been appointed Chief Assistant in the electro-technical department of the Borough Polytechnic, in place of Mr. H. S. Saunders, who has been appointed Responsible Master to a London County Council Junior Technical Institute, and Mr. G. W. Hird as Assistant in the engineering department, in place of Mr. A. E. Gladwyn, who has gone to the West Ham Technical Institute.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.



Mr. Archibald Page, Chief Assistant Electrical Engineer, Glasgow, who was also on the short list at Salford, is having his salary increased from £650 to £800 by annual increments of £25.

The salary of Mr. T. J. Kendrew, Tramways Manager, Southport, is to be increased from £200 to £250 per annum.

The salary of Mr. J. A. Cookson, Mains Surveyor, Manchester, is to be raised from £400 to £450 per annum.

Mr. C. E. Davies, of Erith, has been appointed Mains Superintendent at Hammersmith at a salary of £150, rising to £175, per annum. There were thirty-five applicants.

British Insulated & Helsby Cables, Ltd., require draughtsmen for cable accessories. (See an advertisement on another page.)

## LOCAL NOTES

**Banstead: Electricity Supply.**—A Board of Trade inquiry has been held regarding the application of Mr. Gilbert Allom for a provisional order for supply in the Banstead, Walton-on-the-Hill, and Kingswood districts. The inspector intimated that the order would proceed.

**Barry (Scotland): Electric Supply.**—An electric supply scheme at a cost of £650 has been decided upon.

**Colwyn Bay: Electric Supply.**—Two schemes—one by the Borough Electrical Engineer, Mr. Tudman, involving a new station at the Bron-y-Nant destructor works, and the other for a bulk supply by the North Wales Power & Traction Co.—are to be submitted to an expert for report.

**Connahs Quay (North Wales): Electric Supply.**—A proposal for an electric lighting scheme has been adopted.

**Crowle: Proposed Electricity Supply.**—A proposal for an electric lighting scheme has been considered by the Council, but has been negated.

**Edinburgh: Supply to Suburban Districts.**—A Board of Trade inquiry is in progress regarding the application of the Corporation to include Cramond, Corstorphine, Liberton, and Newton into their area of supply. The Colinton Tramways Co. also ask for power to supply within the parishes of Colinton and Corstorphine for the Corporation.

**Heckmondwike: New Tariff.**—A revised scale of charges with current for lighting at 5d. per unit and power at 1½d., which is a 50 per cent. increase, and a sliding scale, has been decided upon.

**London: Hampstead: Profit-Sharing Scheme.**—The Council has adopted a recommendation of the Committee to reorganise the staff of the Electric Supply Department so that the officials and permanent workmen, who number 139, participate in the profits of the undertaking.

**Kensington: Street Lighting.**—1,000-c.p. half-watt lamps are to be tried experimentally in High Street, Kensington, and if successful the whole of the electric lamps in the Borough will be replaced by them.

**Marylebone: Loans.**—In view of the Borough Council having decided not to take up the loan of £10,825 which had been sanctioned by the L.C.C., the Finance Committee recommends that the resolution granting the loan be rescinded.

**Electric Cooking.**—The charge of 15s. per quarter for the hire of cookers is to be reduced to 3s. 6d., and the charge for current increased from ½d. to ¾d. per unit.

**Manchester: Street Lighting.**—Half-watt lamps are to be installed at the junction of Market Street and Cross Street, and will be suspended from the tramway poles in Oxford Road from Whitworth Street to Cavendish Street, but centrally-suspended lamps are to be provided from Deansgate to Whitworth Street.

**Newport (Mon.): The "Northumberland" Clause.**—The Newport Corporation Bill which proposed to add to the electricity area of the Corporation a number of manufacturing districts outside the borough, has been considered by a House of Lords Committee this week. The case in favour of the extension was that there are a large number of works in the proposed additional area for which a supply of electric power was essential. The only opposition to the scheme was by the Newport Gas Co., which sought either to have it rejected or that the Northumberland Clause, which provides that the rates charged must be so adjusted from year to year that the undertaking must be carried on at a profit, should be inserted. The Committee, however, refused to grant the extended area, and the Gas Company thereupon asked that the Northumberland Clause should be applied to the Borough of Newport in relation to the existing electricity undertaking. After evidence on

both sides, however, the Committee refused to insert the clause.

**Northwich: Electricity Supply.**—The area of supply of the Weaverham Northwich Electrical Supply Co. is being extended to include Sandiway and Buddington. An overhead system is being adopted.

**Nottingham: Electricity Supply.**—According to the commercial year-book of the Nottingham Chamber of Commerce, which contains a quantity of interesting information as to local industries, the total output of the Electricity Works is over 12 million units per annum, of which nearly 3 million represents power and over 5 million tramways, and the average price per unit is 1.79d.

**Reigate: New Tariffs.**—The rate for power is to be reduced from 2d. to 1½d. per unit, and a new rate of 1d. per unit is to be adopted for heating and cooking. Meter rents are also to be abolished, except where the account is less than 10s. per quarter.

**Southampton: Electric Heating.**—An increased price charged for hire of radiators has resulted in many being returned, but it has now been decided to allow those in possession of older types of radiator to retain them at the old charge.

**Swansea: Allocation of Profits.**—After considerable discussion, the Lighting Committee has decided to recommend against allocating any part of the profits of the Electricity Department to the rates.

**Tonbridge: New Plant.**—The new Diesel set was inaugurated last week. The plant was installed by Mirrieles, Bickerton & Day, for £2,100, and is expected to result in considerable saving in costs.

**Wye: Electric Supply.**—At a public meeting last week a resolution in favour of an electric lighting scheme was carried.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**British L.M. Ericsson Mnf. Co.**—The profits for the year have exceeded those of 1912 by £5,218, notwithstanding that prices had to be cut fine to secure post-office work. An 8 per cent. dividend is recommended.

**Cleveland & Durham Electric Power Co.**—A profit of £25,700 has been made on the year's working. A dividend of 5 per cent. on the preference shares is recommended.

**W. T. Glover & Co.**—A trading profit of £33,795 is reported, and dividends of 5 per cent. on the preference and ordinary shares, with a bonus of 2½ per cent. with the latter, are declared.

**Melbourne Electric Supply Corporation.**—£150,000 5 per cent. debentures are to be issued.

**Richardsons, Westgarth & Co.**—A profit of £25,377 has been made, leaving £7,927 after payment of debenture interest and directors' fees.

**Urban Electric Supply Co.**—Out of an available balance of £23,021, a sum of £12,000 is to be placed to reserve, and a dividend of 4 per cent. is to be paid on the preference shares.

**Crompton & Co.**—The proposed scheme of rearrangement was passed at a meeting of debenture-holders on Monday. The debenture interest will be raised from 5 per cent. to 5½ per cent.

## NEW COMPANIES

**BISHOP'S CASTLE ELECTRIC LIGHT & POWER CO.**, 79 Lichfield Street, Wolverhampton. Capital £2,500.

**ELECTRO BLEACH AND BY-PRODUCTS**, Middlewich, Cheshire. Capital, £180,000. Manufacturers of and dealers in electrolytic products. First directors, H. J. MacKinder, J. Swinburne, F. J. Dundas, E. G. Cubitt, and T. W. Stainer-Hutchins.

**Accident at the Westinghouse Works.**—A coroner's inquiry into a fatal accident, due to electric shock, on March 15th, was held on March 17th. It appears that a Mr. J. H. Hepworth was working on a dead conductor, in connection with a test which was in progress, and for some reason made a measurement on a live conductor some distance away, though he knew that the power was constantly being switched on and off. A verdict of accidental death was returned.

**"The Dignity of Business."**—This is the title of a book just published by Ewart, Seymour & Co., Ltd., and written by Mr. H. E. Morgan. It consists of a series of articles principally addressed to parents and those guiding young men in the choice of a career, and training them for the work of life.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 379 [VOL. X., No. 14]  
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THURSDAY, APRIL 2, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

### Latest Time of Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-209, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE wiremen belonging to the Electrical Trades Union were ordered out on strike this morning. Either the membership of this union is considerably less than has been stated, or very many of the members have simply disobeyed the order, for the number of men on strike is extremely small, and, with but one or two exceptions, the wiring work in progress is being continued without interruption. (Page 187.)

THE Council of the Institution of Electrical Engineers has issued its list of nominations for next session's officers and council. Mr. J. F. C. Snell is nominated for the Presidency. (Page 187.)

THE festival dinner of the Electrical Trades Benevolent Institution was held on Wednesday of last week at the Trocadero Restaurant. Mr. Hugo Hirst was in the chair, and it was announced that a sum of over £2,700 had been contributed in connection with the dinner. (Page 188.)

THE preliminary programme of the Convention of the Incorporated Municipal Electrical Association to be held in Birmingham in June under the Presidency of Mr. R. A. Chattock, has been issued. Meetings will be held in Coventry and Stratford-on-Avon, as well as Birmingham. (Page 188.)

THE question of the use of reactances in A.C. distributing systems of 100,000 kw. and above was considered by the Institution of Electrical Engineers at the last meeting, when a Paper on the subject was read by Mr. K. M. Faye-Hansen and Mr. J. S. Peck. Of the three possible places for the insertion of the coils—bus-bars, generator circuit, or feeders—the

meeting, on the whole, favoured the first, with, in some cases, generator reactance as well, as the necessary reactance for the feeder circuits could be incorporated in the transformers at the ends of the feeders. (Page 189.)

THE adaptation of a three-phase motor to run on other voltage from that for which it was designed is discussed in our Questions and Answers columns. (Page 190.)

IN the course of a Paper dealing with commercial motor vehicles, Mr. T. Clarkson referred to the lighting of omnibuses, and described the steam-driven dynamo used on the "National" omnibuses.—Mr. T. G. Gribble has also considered the question of the comparative economics of tramways and railless electric traction. He finds that with a 2½ min. service the cost of working is in favour of the latter by 7 per cent., and the cost of construction by 44 per cent., and that the saving increases inversely as the traffic density.—The new interchange underground railway station at Charing Cross is to be opened on Monday. (Page 190.)

THE principles of long-distance telephony were illustrated by interesting experiments during Prof. J. A. Fleming's discourse at the Royal Institution last Friday. (Page 191.)

THE grant of a patent to H. Leiser for the production of tungsten suitable for drawing into lamp filaments has been allowed, in spite of opposition. The grant of a patent to J. Close for a mine signalling system has been refused by the Comptroller. Last week the Patent Office published specifications relating to variable-speed dynamos, by the B.T.-H. Co.; regenerative motor control, by Crompton & Co.; oil-immersed switchgear, by the A.E.G.; the electrical treatment of plants, &c., by R. M. Mies; and other branches of electrical engineering. (Page 192.)

THE question of the automatic control of mining machinery was dealt with by Mr. G. W. Humphry in a Paper read before the Association of Mining Electrical Engineers. (Page 193.)

AN electric winder recently installed at a French iron mine exemplifies several points of interest in the design of such apparatus. (Page 193.)

SOME features of a modern electric colliery winding plant are given by Mr. J. Gillespie, and the general problem of electric v. steam drive for intermittent loads is considered by Mr. E. I. David. (Page 194.)

THE patent specifications published by the Patent Office during March of interest to mining electrical engineers and electro-metallurgists include some dealing with mine signalling, the manufacture of cement steel, the electro-deposition of copper from solutions containing iron salts, welding, &c. (Page 195.)

AN illustrated article describes an electric power equipment at a large bakery in Scotland. (Page 196.)

A FOOL-PROOF starter and some new indirect lighting

fittings are described in our Trade Section. (Pages 197 and 198.)

New plant, cables, transformers, switchgear, &c., are required at Rawtenstall, Devonport, Plymouth, Wigan, Peterborough, Wallasey, Walsall, and Dudley. —A large scheme of extensions estimated to cost £200,000 is under consideration at Leeds. (Page 199.)

THE Shropshire Power Co. is proposing to issue additional preference capital in connection with its purchase of the Dudley electricity undertaking. —A number of proposals for working the Hove electricity undertaking are being reported upon by the Corporation's consulting engineer. (Page 200.)

THE British Westinghouse Co. reports a record year for 1913, and a net profit of £106,493. —The South London Electric Supply Corporation and the County of London Electric Supply Co. are issuing new capital. (Page 200.)

MR. J. A. ROBERTSON, Borough Electrical Engineer at Greenock, has been appointed Electrical Engineer to the Salford Corporation. (Page 200.)

**Metal-Filament Lamp Patents.**—Last Thursday the Comptroller heard the opposition by Brimsdown Lamp Works, Ltd., to the Grant of Patent No. 12,753/13 to Wolfram Lampen A.G. Judgment was reserved. As given in ELECTRICAL ENGINEERING for December 4th, 1913, p. 683, Vol. IX., the opposers cited sixteen patents as being anticipatory, but they relied chiefly on Nos. 5,206/12 granted to J. Hubers, to whom the invention was committed by Julius Pintsch A.G., 20,227/07 granted to the B.T.-H. Co. as a communication from the G. E. Co. of America, and 27,710/10 granted to Lichtwerke G.m.b.H. They also said that the invention was not fairly described. It was admitted that the invention consisted in the application of a known material to a new purpose—filament supports of 98 per cent. tungsten and 2 per cent. of thorium oxide. The Brimsdown Co. argued that it was well known to use filament supports of the same material as the filaments, and the use of thorium with tungsten was known. The argument was on narrow issues, and included whether the resulting support was a mixture or an alloy.

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, APRIL 2ND.

*Institution of Electrical Engineers.*

"The Signalling of a Rapid Transit Railway," by H. G. Brown.

FRIDAY, APRIL 3RD.

*Royal Institution.*

9 p.m. Evening discourse on "Further Researches on Positive Rays," by Prof. Sir J. J. Thomson, F.R.S.

MONDAY, APRIL 6TH.

*Society of Engineers.*

7.30 p.m. At Institution of Electrical Engineers. "The Utilisation of Solar Energy," by A. S. E. Ackermann.

TUESDAY, APRIL 7TH.

*Institution of Electrical Engineers: Manchester Local Section.*

7.30 p.m. At University. "Current Limiting Reactances on Large Power Systems," by K. M. Faye-Hansen and J. S. Peck.

*Illuminating Engineering Society.*

8 p.m. At Royal Society of Arts. Discussion on "The Lighting of Railway Carriages and other Public Vehicles," to be opened by E. K. Scott.

WEDNESDAY, APRIL 8TH.

*Institution of Electrical Engineers: Birmingham Section.*

7.30 p.m. At the University. "Reactances in Alternating Current Circuits," by J. S. Peck.

SATURDAY, APRIL 11TH.

*Association of Mining Electrical Engineers.*

6.30 p.m. S. Wales Branch, at Technical College, Swansea. "Automatic Controllers for Mining Work," by G. W. Humphry.

## The London Electrical Engineers.

Headquarters (46 Regency Street, S.W.) open Sats. till noon.

Rating Exam. for all Cos. from 7 to 10 p.m. every Wednesday.

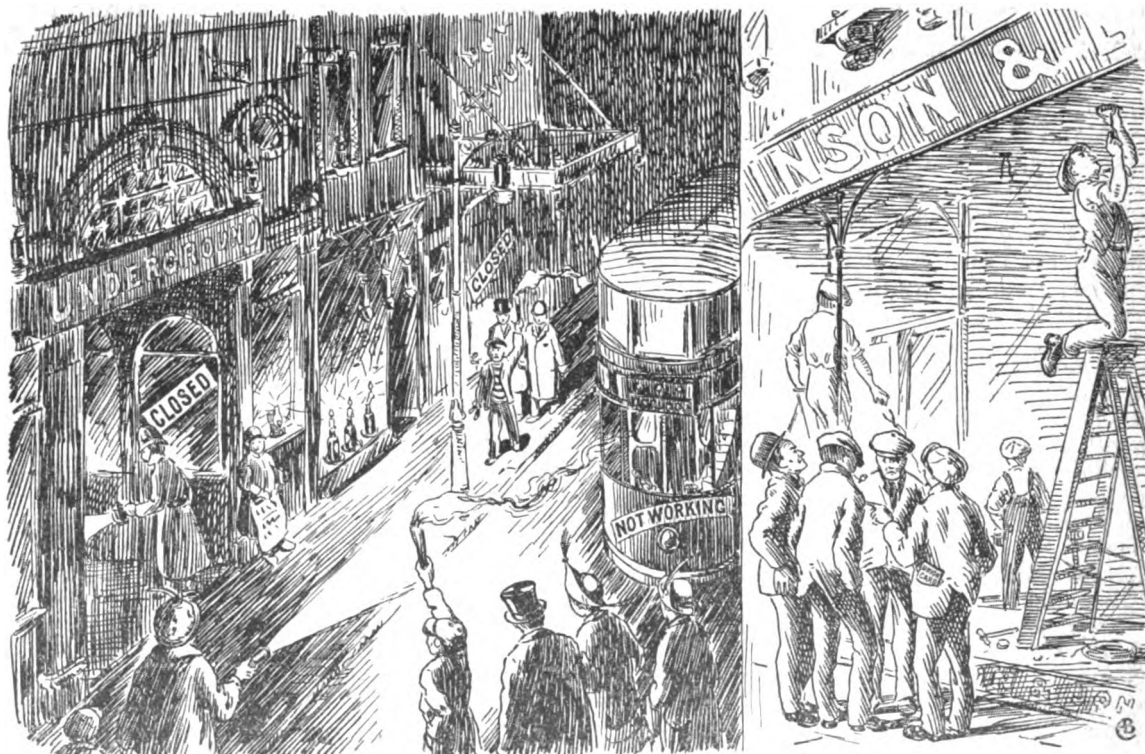
Easter Camp will be at Cliffe Fort, near Gravesend, from April 9th (parade at Headquarters at 11 a.m.) till April 18th. Camp cards must be sent in at once.

(TO-DAY) THURSDAY, APRIL 2ND, C. Co. FRIDAY, APRIL 3RD,

D. Co. MONDAY, APRIL 6TH, A. Co. TUESDAY, APRIL 7TH,

B. Co., Tech. Inst., 7 to 10 p.m. Min. Range, 7 to 9 p.m.

WEDNESDAY, APRIL 8TH.—Recruit Instruction, 7 to 10 p.m.



THE ELECTRICIANS' STRIKE: As the Daily Papers predicted.

As it is.

## WIREMEN'S STRIKE IN LONDON

**A**LTHOUGH the London Branch of the Electric Trades Union instructed its members to strike at nine o'clock yesterday morning, very few men indeed have left work.

Yesterday morning, inquiry of some of the chief firms of wiring contractors and others in London, elicited the following information:—

*H. J. Cash & Co.*—One man on strike out of about 40 engaged in London. No picketing.

*Drake & Gorham.*—Would not have known that a strike had been declared unless they had read it in the daily papers. Possibly one or two of the men may not have turned up on some of the jobs in hand, but no difference is noticeable.

*Edmundsons.*—Little work in London. No strike.

*Electrical Installations, Ltd.*—About 14 on strike, and about 80 at work.

*Rashleigh Phipps.*—About 70 men at work. Six union men were paid off last night. No picketing.

*Rawlings Bros.*—Three union men have struck work, and have been replaced by non-union men. About 30 men are at work in London. No picketing.

*Strode & Co.*—Out of about 65 men, only about a dozen are working. Four of their foremen are members of the Electrical Trade Union, and a large proportion of the workmen.

*Trollope and Colls.*—No men on strike. About 40 to 50 wiremen at work—all non-union. Men thoroughly satisfied.

*Duncan Watson.*—No men on strike; 50 to 60 hands working.

*Whiteley's.*—No men out. About 25 men working in London.

*Harrods.*—Twelve men on strike, and about six working.

*Pinching & Walton.*—No men on strike, but only about 6 men working in London at present.

*Marryat & Place.*—No men out; about 30 wiremen working.

*V. G. Middleton.*—Twelve men on strike.

*Donnison, Sillem & Co.*—All their men on strike; about 20 have ceased work.

*Leonard Tate & Co.*—No men on strike, about 6 employed in London at present.

*Buchanan & Curwen.*—No men on strike, about 12 men working in London at present. No picketing.

*G. E. Taylor & Co.*—No men on strike, about 20 employed.

*Marylebone Borough Council.*—Not affected. Do no regular wiring work themselves. None of the meter fixers are out, and no trouble in construction department or at the generating station.

*Grant & Taylor.*—Fifteen men on strike out of about 20.

*J. Lyons & Co.*—The men at work on the new hotel in Glasshouse Street, Piccadilly, have struck work.

*Maple & Co.*—Seven men have ceased work out of about 60 working in London.

*Higgins & Griffiths.*—About 30 men out on strike, and in consequence very little work doing in London. About 18 of these, however, were already out "in sympathy" with the builders, and the remaining 12 or so have struck to-day.

The sequence of affairs since last Thursday is as follows: Last Thursday, the London Electrical Masters' Association refused to grant any further concessions; they had already granted an increase of minimum wages to competent wiremen (not including mere pipe-fitters) from 9d. or 9½d. an hour to 10d., with a further rise to 10½d. in July. On Friday the Electrical Trades Union discussed the matter for seven hours, and decided that a strike should be called for a minimum wage of 11d., to all workers (they refused to allow any differentiation between pipe-fitters and wiremen), and they further refused to agree to the condition that the Union men should work amicably with non-union men. The men were instructed, however, that they might work for 10½d. if the other conditions were agreed to by the masters, but no firms have done so.

It appears that, before giving the date for the strike, the Union approached the masters again and begged them to reconsider their decision, but they stood firm. The Union then instructed their members to cease work yesterday morning at nine o'clock, but, as seen above, the response has been ridiculously small, and except in the case of one or two firms, the work is unaffected.

Some of the daily newspapers published sensational articles last week, intimating that a general electrical strike was threatened, and that the electric lighting of the metropolis would be affected and the tubes and tramways stopped, but these were quite without foundation, and as seen above, the strike is confined to a few ill-advised wiremen, who will doubtless soon see the futility of their action.

It will be noted from the figures above that the total number of men employed by the larger wiring firms in London is much smaller than usual. There is, in fact, an exceptionally small amount of wiring work in progress; some is held up on account of the builders' strike, and generally the orders for new wiring work have been less than is customary at this time of the year owing to the unrest in the building trade.

We are asked by the Association of Electrical Station Engineers to say that this Association is not in any way connected with the Electrical Trades Union, and that there is no question of the central station employees joining the strike.

## THE INSTITUTION COUNCIL

**T**HE nominations by the Council of the Institution of Electrical Engineers for the new Council for 1914-15 have just been issued, and balloting papers will be sent out on May 1st. In accordance with the Articles of Association, two names in excess of the number of vacancies have been nominated, and it is open to any ten members to nominate any further candidates before the 21st of this month. The following is a list of the nominations:—



J. F. C. SNELL.

Nominated as President of the Institution for 1914-15.

**President:** Mr. J. F. C. Snell, nominated to succeed Mr. W. Duddell, who is retiring from the Council. Mr. Snell is partner in the firm of consulting engineers, Messrs. Preece, Cardew & Snell. He has risen to be nominated President very quickly, having only been elected Vice-President in 1911. He was on the Council first in 1909.

**Vice-Presidents:** Messrs. J. S. Highfield and C. H. Wordingham are nominated in succession to the Hon. Sir C. A. Parsons, who retires from the Council, and Mr.

Snell, who is raised to President. Messrs. W. Judd and C. H. Merz remain in office as Vice-Presidents. Mr. Highfield is Engineer and Manager of the Metropolitan Electric Supply Co., and has been on the Council three times before—in 1904, 1911, and 1913. Mr. C. H. Wordingham is Electrical Engineer to the Admiralty. He was on the Council first in 1896, and has served several times since. Neither Mr. Highfield nor Mr. Wordingham have been Vice-President before.

**Ordinary Members of Council:** There are six vacancies, due to the nomination of Mr. Highfield as Vice-President and the retirement of Messrs. H. Hirst, B. M. Jenkin, J. E. Kingsbury, C. P. Sparks, and H. E. Wimperis.

The following eight members are nominated for the ballot for these vacancies:—Prof. B. Hopkinson, F.R.S., who is Professor of Mechanical Sciences at the University of Cambridge; Mr. G. W. Partridge, Engineer-in-Chief of the London Electric Supply Corporation; Mr. W. H. Patchell, formerly Engineer-in-Chief of the Charing Cross, West End & City Electricity Supply Co., and now in consulting practice; Mr. W. Ll. Preece, a member of the firm of Preece, Cardew & Snell, and a son of the late Sir William Preece; Mr. G. S. Ram, Electrical Inspector of Factories; Mr. W. Slingo, Engineer-in-Chief to the Post Office; Mr. A. A. C. Swinton, Consulting Engineer; and Mr. W. B. Woodhouse, Engineer-in-Chief to the Yorkshire Electric Power Co. Prof. Hopkinson, Mr. Woodhouse, Mr. Slingo, Mr. Ll. Preece, and Mr. Ram have not served on the Council before, but Mr. Ram was a candidate in 1913. Mr. Swinton has been on the Council several times since 1897, and Mr. Patchell was



Vice-President in 1905, 1910, and 1911, and first joined the Council in 1907. Mr. Partridge served on the Council for three years since 1906.

Messrs. R. A. Chattock, F. Gill, W. Rutherford, A. H. Seabrook, Roger T. Smith, and Dr. A. Russell remain in office.

Mr. Robert Hammond is nominated for re-election as Honorary Treasurer.

The three Associate Members and three Associates who are on the Council remain in office. The three Associate Members are Messrs. F. E. Berry, A. W. Martin, and Captain E. O. Henrici, C.B.; and the three Associates are Messrs. A. B. Anderson, E. Russell Clarke, and A. M. J. Ogilvie, C.B.

### FESTIVAL DINNER OF THE ELECTRICAL TRADES BENEVOLENT INSTITUTION

IN every way the Annual Festival Dinner of the Electrical Trades Benevolent Institution, held on Wednesday, March 25th, at the Trocadero Restaurant, constituted a record, and its unqualified success is in large measure due to the personal work of the Chairman, Mr. Hugo Hirst, which is evident from the large proportion of the contributions in connection with the dinner which are included under the "Chairman's list." It was announced that the total sum already contributed to the dinner fund was £2,762, including this list. One hundred and eighty-three dinner tickets were sold, and we understand the actual collection in the room amounted to £162, including a gift of twenty guineas from Mr. Godfrey Isaacs. Letters regretting inability to attend were received from about forty gentlemen and from representatives of the following Societies:—Institution of Electrical Engineers, Association of Mining Electrical Engineers, British Electrical and Allied Manufacturers' Association, Consulting Engineers Association, Electric Vehicle Committee, London Electrical Engineers, Incorporated Association of Electrical Power Companies, Incorporated Municipal Electrical Association, Municipal Tramways Association, Tramways and Light Railways Association, Electrical Surveyors' Society.

The toast of the evening, that of the Electrical Trades Benevolent Institution, was proposed by Mr. Hirst in a happy speech. In the younger days of the industry, he said, there had been, perhaps naturally, neglect to make provision for those who fell by the wayside, but now, as the industry was older, such provision was a necessity. It was particularly so in the electrical industry, which included many whose position made them hesitate to show their troubles in the light of day. Their fund was to provide for such, as well as the classes who had the right to call for help. He wished to thank all those who had come forward so handsomely, and particularly Mr. E. Garcke, for his help in connection with Mr. Byng's offer last year, and he thanked his own colleagues and staff, by whose help contributions had been obtained even from many outside the actual industry. He also gave the Press his heartfelt thanks for their valuable help. He had received many curious letters in connection with his appeal to electrical firms. Some had criticised the high ratio of expenses to relief given, but this was necessarily so at the start. Others suggested that when the electrical trade was prosperous was not a suitable time to beg. He himself thought it was the very best time. Again, some firms declined to contribute, as they had sick funds, &c., of their own, but in this connection he reminded them that men in the electrical industry rarely remained with one firm throughout their whole career. Some sheltered behind the aesthetic criticism that it was undignified to beg. He would himself like to see on their Council more official representation of such bodies as the B.E.A.M.A., the I.M.E.A., the E.C.A., &c., which he thought would result in an automatic income from the membership of these bodies; but in the meantime he could do no more than quote the well-known words: "Pass the hat, and pay, pay, pay."

The toast was supported by Sir David Salomons (President of the Institution), who spoke gratefully of the work of his predecessor, Sir William Preece, and in looking back to the days when telegraphy was the only electrical engineering we knew, and again to the time of the discovery of the principle of the dynamo by Faraday, he showed how the growth of a mighty industry had necessitated such a fund.

Mr. C. H. Wordingham (Vice-President) also spoke, and related how he was at one time against the establishment of

the fund as well as that of the Institution of Electrical Engineers as the multiplication of organisations did not tend to economy. Now, however, as he had come to realise that the latter fund only related to members of their own Institution, and that the Electrical Trades Benevolent Fund benefited a vastly larger class, he was an enthusiastic convert. It had been urged that since the passing of the Insurance Act there was no necessity for these funds, but there were many who were benefited by them who did not come under the Act at all. That they were at present only able to pay comparatively small sums in relief was due to the fact that such payments had to be made from income, and not from capital. In conclusion, he suggested that perhaps kinship might be claimed with some of the rich City Companies, such as the Fanmakers, the Wire drawers, the Waxchangers, and indeed the Girdlers, for had not electricity put a girdle round the earth?

The toast was further supported by Mr. Godfrey C. Isaacs (Managing Director, Marconi's Wireless Telegraph Co.), in the absence of Mr. F. Faithfull Begg, Vice-President. He appealed, not on the ground of charity, but put it that it was a duty of every large industry to provide relief for those who needed it. We were, he said, a nation particularly devoid of thrift, and such a scheme was of exceptional value as a lesson in thrift. His own company had such a fund, to which at present £5,000 a year was contributed, half by the firm and half by the employees, but he hoped that when sufficient capital was accumulated this, as should be also that of the Electrical Trades Benevolent Institution, would become self-supporting.

The health of the Chairman was proposed by Mr. Justus Eck (Chairman of the Committee), who expressed his appreciation of Mr. Hirst's valuable work for the Institution, not only in presiding there and in collecting contributions, but in interesting his colleagues in the movement. He referred to the late Mr. Gustave Byng's bequest and his son's generous offer last year. Mr. Hirst then replied briefly, and remarked that he hoped that the total of £2,762 which had been mentioned was not quite complete.

During the evening an excellent programme of music was performed, to which Mr. T. E. Gatehouse contributed some violin solos.

### THE CONVENTION OF THE MUNICIPAL ELECTRICAL ASSOCIATION

THE preliminary programme of the Nineteenth Annual Convention of the Incorporated Municipal Electrical Association, to be held in Birmingham on June 15th to 20th next, has now been issued. At the opening meeting (at the Midland Institute), on Tuesday, June 16th, the members will be welcomed by the Lord Mayor, Mr. R. A. Chattock will give his presidential address, and a Paper on "The Commercial Development of Electrical Supply in Towns of Moderate Size," by Mr. W. A. Vignoles, will be read. For the afternoon, visits have been arranged to the works of the General Electric Co. and Belliss & Morcom. The Birmingham Corporation Electricity Works, Summer Lane, and the works of the following firms will also be open for inspection: Chamberlain & Hookham; Electric & Ordnance Accessories Co.; Veritys, Ltd.; Simplex Conduits, Ltd.; Berry, Skinner & Co.; Tubes, Ltd. Ladies accompanying the party will have the opportunity of visiting the Birmingham Art Gallery and Elkington's showrooms and works, and the Annual Dinner will be held at the Grand Hotel in the evening.

Wednesday's meeting will be held at Coventry, and Mr. S. E. Fedden will read a Paper on "The Design and Operation of Modern Boiler-House Plant." The Mayor will entertain the party to lunch, and visits to the Corporation Electricity Works and the Daimler Co.'s works have been arranged for the afternoon. The Coventry Ordnance, Triumph Motor Cycle, and Coventry Chain Companies' works will be open to inspection. The British Thomson-Houston Co. and Willans & Robinson are also making arrangements to convey members desirous of seeing their works to Rugby and back during the afternoon. Ladies will be able to visit Coombe Abbey in the morning and places of interest in Coventry in the afternoon. The party will then return to Birmingham, where a reception and dance will be given by the Lord Mayor and Lady Mayoress (Lt.-Col. and Mrs. E. Martineau).

On Thursday a morning meeting will be held at Stratford-on-Avon, where Mr. J. Horace Bowden will read a Paper on "Standardisation of Tariffs." The ladies will visit places of interest in the town in the morning, and Warwick will be visited in the afternoon. An open-air fête at the Botanical Gardens, Edgbaston, Birmingham, will be held in the evening.

On Friday the Annual General Meeting will be held in the morning, and the Summer Lane generating station of the Birmingham Corporation will be visited in the afternoon. For those remaining till Saturday a visit to Worcester has been arranged.

## REACTANCES

"CURRENT Limiting Reactances on Large Power Systems" was the title of a Paper by Mr. K. M. Faye-Hansen and Mr. J. S. Pack, read before the Institution of Electrical Engineers last Thursday. Because of the increase in size of modern generating stations and their liability to sudden changes of load, owing to supplying large manufacturing concerns, tramways, and railways, it is important that any trouble occasioned in one section be limited to that section and kept as small as possible. To effect this current limiting reactances may be used. These may be placed in the generator leads, in the feeders, or between sections of the bus-bars. If placed in the generator leads the following advantages are obtained: Bus-bar pressure may be kept constant, so that it is the same for all feeders; no damage is done to the generators in the case of a short-circuit on a feeder or bus-bar; no damage is done to the generator circuit-breakers in any case, and synchronous apparatus will not fall out of step in the case of a short-circuit on the generator. Against these advantages must be set the following disadvantages: Enormous current-rush into a short-circuit on a feeder, excessive load on the feeder circuit-breaker in the case of a fault on a feeder, and synchronous apparatus may fall out of step, and a complete shut-down follow a short-circuit on a feeder or bus-bar. Reactances only in the generator leads are therefore only of use for protecting generator windings and circuit-breakers. If the generator reactance were 6 per cent., and 6 per cent. were added, the maximum current which could flow would be  $8\frac{1}{2}$  times normal, or somewhat more than this, due to the doubling effect. Any generator should be able to stand this. Where transformers are used between the generators and bus-bar, they may themselves be designed with high internal reactance. With regard to placing reactances in the feeders the following advantages will accrue: A short-circuit on a feeder causes no serious disturbance on the system, and there is no excessive overload on circuit-breakers or generators. The feeder circuit-breakers may be of smaller breaking capacity than those where feeder reactances are not used. The tendency of synchronous apparatus to feed back in the case of a bus-bar fault is slightly reduced. On the other hand, the pressure-drop on the feeders will vary with the load, and cannot be compensated for by varying the bus-bar pressure. A short-circuit on the bus-bar or generators is a short-circuit directly on the terminals of all generators. The generator windings and circuit-breakers may be damaged and the complete plant shut down. A short-circuit on any generator or between any generator and its circuit-breaker may throw an excessive load on this circuit-breaker, and if it fails to clear the fault the whole system will be shut down. The size of feeder reactances will depend on the capacity of the feeder compared with that of the generators, and upon the breaking capacity of the feeder circuit-breaker, so that unless the total feeder rating is greatly in excess of that of the generators the total k.v.a. capacity of the reactances will be less. If the rating is in excess, their use may not be justified. If step-up transformers are used, they may be designed with high internal reactance without appreciable increase in cost. If reactances are used in the bus-bars trouble is confined to the particular section on which the fault occurs, the amount of current that can be fed into a fault is reduced, and the danger in the case of bad synchronising is considerably reduced. However, no protection to a generator is given when a short-circuit occurs on or near its bus-bar section, and the generators coupled to the different bus-bar sections must be run with a certain angular displacement in their pressures.

By using reactance in generator circuits and feeders trouble is confined to the particular feeder section affected, the load on the feeder circuit-breaker is reduced, and the fault damage is reduced. By placing reactances in feeders and bus-bars the greatest possible freedom from operating troubles is obtained, and if the generators can safely withstand short-circuit, or if the chance of a short-circuit in the bus-bars is considered negligible, some form of this arrangement probably offers the most complete solution of the problem. If the different sections of the bus-bars feed into the same bus-bars at the sub-stations, however, the impedance of the cables connecting the different sections may be less than that of the reactance coils, so that much of their advantage will be lost. Also there is the possibility that when one section is more heavily loaded than another, the cables on one section will be overloaded, due to the angular displacement in pressure between the sections.

The coils themselves may have their magnetic circuits entirely in air, or an arrangement using a central air core with an external iron path of laminated stampings may be used. The larger the capacity and the lower the frequency the less the advantage of this construction. For feeder reactances where the maximum short-circuit current is perhaps twenty to thirty times the normal that the coils can carry without overheating the air-core construction is best, but for bus-bar reactances, where the maximum current will not as a rule be more than four to ten times the normal, the construction using some iron may prove more economical. This may also be true for generator reactances in some cases.

The Discussion was opened by Mr. W. B. Woodhouse (Manager and Chief Engineer, Yorkshire Electric Power Co.), who remarked that all alternating-current apparatus except switchgear had reactance as well as resistance. The tendency lately had been to build machines with 10, 15, or even 20 per cent. reactance. He hoped it was not beyond the power of designers to build also machines capable of standing up to the momentary current rush on short-circuit. He did not think that external reactance would be necessary. With regard to feeders, if the switchgear could be made to stand the short-circuit current, here also added reactances would not be required, but additional protection could be afforded by switchgear. Sectional bus-bar resistances were, however, desirable. The cost of introduction was not very great, but the regulation of the system was made worse, and synchronous condensers would have to be added. He was able to run two stations having turbo-alternators with 20 per cent. reactance successfully in parallel over a line thirteen miles long without added reactance. Mr. G. W. Partidge (Chief Engineer, London Electric Supply Corporation) thought that his company was the first to use reactance coils in this country, in connection with the supply to the Brighton Railway. These had some iron in the magnetic circuit, and took a maximum current of 20,000 amperes. They weighed fifteen tons. Air core coils were very good if room could be found in the station for them. He sketched a system designed to give great flexibility and protection against bad synchronising, at the same time cutting the size and number of coils down to a minimum, at the expense, however, of increased switching. He showed also some oscillographs taken by Mr. W. Duddell on a 7,500-kw. turbo-alternator to demonstrate how effective the reactances at Deptford were. Mr. J. Shepherd (L.C.C. Tramways) estimated that the cost of the reactances advocated would be about 10 per cent. of the generator cost, and with the accessories, connections, &c., would reach 12 or 13 per cent. He thought that relay protective systems were more sensitive, as, in general, the short-circuits did not come on suddenly. The use of bus-bar reactances would necessitate a special room for their reception. If iron were used they would be very heavy. Reactance in the field circuits would be an advantage. Mr. A. R. Everest (B.T.H. Co., Rugby) said that the generator windings would be protected by internal reactance when built for 50 cycles, but for 25-cycle machines it was sometimes necessary to add external reactance, put as close as possible to the windings. Feeder reactance coils had the disadvantages of increased pressure drop and prohibitive space and cost, and could only be used if the feeders were grouped. Sectionalising the bus-bars by reactances accomplished much more. It limited the feeder current, permitted different currents in the different bus-bar sections, and protected the generator against a general short. The ironclad type of reactance was best on account of space, but in general the air core type was safer, and space should be found to house them. Mr. E. P. Hollis (G.E.C., Witton) showed how reactances could be used for many purposes other than those dealt with in the Paper. Mr. E. B. Wedmore (B.T.H. Co., Rugby) drew a distinction between series and parallel reactances, the latter taking little current and having little effect on the power-factor. He said that it was not commercially practicable to work stations of 100,000-kw. capacity without reactances. It was necessary to ensure somehow that no switch had to open the full 100,000 kw. No station of this size would be built without transformers stepping up to 20,000 or 30,000 volts, and these could have sufficient reactance to do for the feeders. The possibility of hunting had also to be looked into. He thought that a reactance of 20 per cent. for the bus-bars was sufficient, as above this the cost increased disproportionately. The magnetising current had to be supplied by the machine attached to each section, and, if too great, limited the output. It would be found best to cut down the size of the bus-bar sections as much as possible. The reactance of cables between individual consumers was valuable. Mr. G. C. Allingham pointed out that internal reactance would not protect the generator windings against pressure rises; and Mr. Faye-Hansen replied. He would not agree that air reactances were safer than ironclad reactances.

Royal Institution.—Among the lecture arrangements after Easter are two lectures by Prof. Silvanus P. Thompson on "Faraday and the Foundations of Electrical Engineering."

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,385.

A 50-h.p. shunt-wound interpole motor is used for driving a motor-boat direct on the propeller. During some trials with the boat moored, the speed of the motor was 30 per cent. under full speed while the motor was taking full load current. It was impossible to obtain a higher speed than this, as the current rose to a dangerous degree, while the shunt regulator was moved very slightly. Suggest the cause of this loss of speed and control, and state if better results should be expected with a trial under way.—"STOKER."

(Replies must be received not later than first post, Thursday, April 9th.)

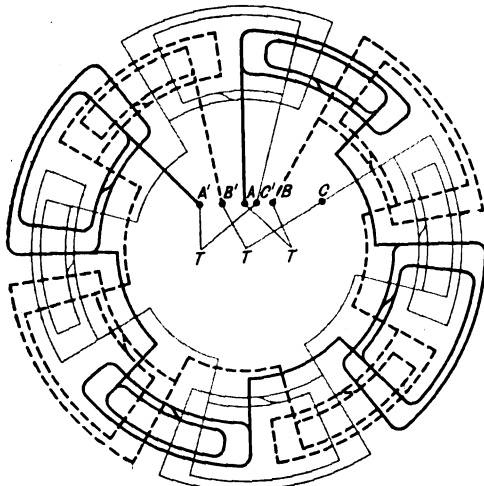
### ANSWER TO No. 1,383.

I have a 30 h.p. three-phase motor, which is designed to run on a 365-volt circuit, at 580 r.p.m., 40 cycles. The only supply pressures available are 230 volts, and 625 volts, 40 cycles. What do you advise me to do?—"UTILITY."

The first award (10s.) is given to "P. B. F." for the following reply:—

Assuming that the motor is of the induction type, three cases will be considered: the number of poles and the speed will not be affected by the proposed changes.

If starting is performed by means of a star-delta switch and the rotor is of the squirrel-cage type, the only method



MESH CONNECTIONS.

For Star Connections, join A' B' C' together and A B and C to the three terminals.

available is to provide a three-phase auto-transformer with a ratio of approximately 625 to 375 or 230 to 375.

If starting is performed by means of a rheostat in the circuits of a wound rotor, and the existing stator is mesh-wound (see accompanying diagram of an 8-pole motor having

two slots per pole per phase), the three joints should be opened and the connections changed to star, when the motor will operate satisfactorily on the three-phase 625-volt circuit. There will probably be no difficulty as to the windings being sufficiently well insulated to withstand the higher voltage.

If starting is performed by means of a rheostat in the circuits of a wound rotor and the existing stator is star-connected, then the neutral point should be opened and the ends rearranged in mesh, as indicated in the figure.

Under these conditions the motor will run from the 230-volt three-phase circuit. The applied voltage will, however, be somewhat higher than the motor windings are designed for, and the higher flux density in the iron will result in higher iron losses. If the temperature-rise is already high under normal conditions (say 100° F. by the increase of resistance method), it will be advisable to keep the load on the motor somewhat below 30 h.p., so as to prevent injurious overheating.

The second award (5s.) is given to "R. W. J.," who writes as follows:—

The possibility, and also the advisability, of adapting plant to service under conditions other than those for which it is designed depend largely upon circumstances.

As the frequency of the motor in question is the same as that of the supplies available, transformers or auto-transformers could be utilised to obtain the required voltage, the motor then running under rated conditions, with a somewhat reduced overall efficiency due to transformer losses.

The cost of these, however, could be saved if the stator winding permits of rearrangement. (a) If, for instance, it is "mesh" connected and the insulation will allow, the phases may be put in star, when, with the same phase conditions, the terminal pressure becomes  $365 \times \sqrt{3} = 632$  volts, which is sufficiently near 625 volts to utilise that supply, particularly if the declared volts are exceeded, as is sometimes the case. (b) If, as is more probable, the windings are star-connected, they may be put in mesh, when the terminal

pressure for normal conditions would be  $\frac{365}{\sqrt{3}} = \text{over } 210 \text{ volts;}$

which is again not very far from 230. Local conditions will determine whether either of these methods, or modifications of such, are practicable. The speed will be approximately the same throughout, being the difference between synchronous speed (which in this case—apparently that of an 8-pole motor—is 600 r.p.m.) and the slip. This latter, with voltage below normal (case a), will be somewhat greater than normal (20 r.p.m.), giving reduced rotor speed; and vice versa in case b. The rotor circuit will in either case remain unaltered, unless the new starting current is found to have become too large (which is hardly likely), when the resistances will require readjustment.

Several other competitors give practically the same solution. One of them, "H. O. W.," suggests also that if the motor can be arranged to run off the 625-volt supply, it might be possible to start it up on the 230-volt circuit by means of a throw-over switch.

## ELECTRIC TRACTION NOTES

The Paper by Mr. T. Clarkson on "Recent Developments in Commercial Motor Vehicles," read last week before the Institution of Civil Engineers, although mainly devoted to steam and petrol omnibuses and other vehicles, contained some references to electric vehicles. He mentioned the great development of this form of road traction in America, and thought that in the congested traffic of London, where speeds were necessarily slow, their outlook was promising. He referred to the statistics collected by the Massachusetts Institute of Technology, showing the markedly greater economy of automobiles over horse haulage in many different circumstances. No comparative figures of costs, however, for electric and other types of vehicle were given. For motor-omnibus work it was impracticable to bring the weight within the new limit imposed by the police regulations, which now included the battery in the allowed weight of the vehicle, which was formerly not the case. Another interesting point taken up was the electric lighting of motor-omnibuses. In some petrol omnibuses the plain battery system was employed, but with the weight of battery permissible under the police regulations only a comparatively feeble light could be obtained. The dynamo and battery system gave better

illumination, but was more expensive and complicated. It was largely used on petrol vehicles, but in his own steam omnibuses had been superseded by a dynamo driven direct by a small steam engine without any battery. A simple design of engine was used, and in view of the variation in steam pressure it was supplied through a reducing valve. The set ran at 950 r.p.m., and gave 14 amperes at 12 volts. It was cheaper to instal and to maintain, and saved about 100 lb. in weight over the dynamo and battery system.

The question of the comparative economics of tramways and railless electric traction was considered by Mr. T. G. Gribble in a Paper read recently before the Institution of Civil Engineers. The trolley omnibuses put in service in this country up to the present time, says the author, are of the single-decked type, and have seats for twenty-eight passengers, but a double-decked omnibus with thirty-eight seats has been tested with satisfactory results. The average number of passengers per tramcar-mile ranges from 5'39 to 12'92, so if nine passages per car-mile be assumed, a single-decked omnibus should be able to carry the traffic. At Dundee on Saturdays and Sundays the receipts per omnibus-mile often average 25d., and at Rotherham, without excessive overcrowding, the average receipts for a considerable period were given as 13d. per mile. The cost of construction of a trolley-omnibus system may be taken as being that of a tramway (including power station) minus the track. The author quotes the results of some tests made on the "Electrobus" in 1908 on a run from Liverpool Street to Victoria. The average consumption of four east-bound trips was 144'1 watt-hours per ton-mile (the omnibus loaded weighed 7½ tons), and of four west-bound trips 123'3 watt-hours per ton-mile. Some tests at Bradford on a 5½-ton trolley omnibus in 1912, on a snow-covered macadam road, with several gradients, in a good state of maintenance, were also made. From these the conclusion is drawn that the maximum momentary demand on the power-houses when accelerating may range from 24 to 40 kw. When running full speed on the level the demand is 9'6 kw., so that if more than one omnibus is running, the capacity of the power station, 25 kw. with reserve for one omnibus, can be reduced. Supposing a daily performance of 105 miles per omnibus in service, with an average consumption of 0'9 units per omnibus-mile, the units per annum per kw. provided would be 1,380, a lower factor than it is usual to assume for large traction plants, and too high only for the smallest services. Assuming, also, the liberal allowance of £20 per kw., including buildings, a final estimate of £500 for the power station per omnibus in service is arrived at. The cost of upkeep of rubber tyres may be taken as 1½d. per omnibus-mile. The general conclusions reached are: (1) That with a traffic density represented by a 2½-min. service, the cost of working is in favour of the trolley omnibus by about 7 per cent., but the cost of construction is, however, about 44 per cent. less than that of a tramway; (2) that the saving increases inversely with the traffic density, so that with a time interval of thirty minutes the cost of working is about 36 per cent. less, and that of construction about 70 per cent. less. The idea that the economy of the trolley omnibus ceases at a service frequency of about ten minutes, is, in the author's opinion, quite unfounded.

Monday next should see the finish of the alterations at Charing Cross, whereby there will be complete interchange facilities between the District Railway and the Hampstead and Bakerloo Tubes. The Hampstead line is carried from the old terminus at Charing Cross in the form of a loop, part of which is under the Thames, to a single-line platform below the District station and parallel with the Bakerloo station further west. The diameter of the tunnel is 11 ft. 8½ in., which is increased to 12 ft. 9 in. on the curve under the river. From the western ends of the District platforms short flights of steps lead down to a circulating area divided into two sections, one under each of the platforms, and connected by a passage. In each section are moving stairways communicating with the Tube station below. On the west the stairways connect with the Bakerloo line (these were opened on March 2nd), and on the east with the new station of the Hampstead Railway. There is also a passage from the Hampstead line station to the foot of the Bakerloo stairways. The reconstructed station is to be known as Charing Cross (Embankment), and the original terminus of the Hampstead Railway as Charing Cross (Strand).

Although the Brighton Corporation advertised a short time ago for tenders for the equipment of their proposed omnibus routes, none of the tenders which have been received for cars, tyres, or line equipment have yet been opened. We believe this is due to unforeseen difficulties in agreeing with the

Hove Corporation, and the Brighton Corporation has fixed a period of three months as a time-limit before it will apply to the Board of Trade to appoint an arbitrator under the Act of Parliament to settle the difference between the two authorities.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Some extremely interesting experiments illustrated Dr. J. A. Fleming's discourse on "Long-Distance Telephony" at the Royal Institution on Friday. Use was made of cords of different thickness regularly vibrated by a motor and loaded in various ways by beads, to show the propagation of stationary waves in an electric line with different line constants, and with and without loading coils, and the reflecting effect of the loading coils was prettily demonstrated by this means. Another effective lecture-experiment was to project on the screen the oscillogram of a wave representing a complex sound transmitted through a cable at different points along the length of the cable, with the oscillogram of the original sound below it. The gradual disappearance of the higher harmonics was brought out very clearly. Dr. Fleming neatly divided the honours of the loaded cable between Heaviside and Pupin. Heaviside, he explained, had enunciated the law of the distortionless circuit, and had pointed out the importance of adding inductance, twenty-five years ago, but electrical engineers had not had sufficient confidence to act on his suggestions; in 1899 or 1900, however, Pupin had given the important law that the use of coils to increase the inductance was feasible if there were at least eight or nine in one complete stationary wave-length. The end-reflection effect when a loaded cable is used with an unloaded line at each end was clearly explained and demonstrated, as well as the remedy of tapering off the loading; and phantom circuits, and the method of loading the phantom circuit as well as the main circuits was briefly shown. No mention was made of telephone relays, and it was rather to be regretted that the short time devoted to wireless telephony (which hardly came within the scope of the title of the discourse) was not allotted to them. Coming to results in actual practice, Dr. Fleming said that the longest telephone line in use is now from New York to Denver, a distance of 2,000 miles; this had been rendered possible by the use of loading coils, and it was hoped to extend the line to San Francisco, making the total length 3,000 miles. The Berlin-Rome line just completed is 2,082 km. long, with loading coils 10 km. apart. In this country the Post Office is extending the use of loading coils rapidly on the trunk lines; at present they have 30,000 miles of wire fitted with loading coils, and a further 45,545 miles are being fitted with them. This includes the 50-circuit underground cable from London to Liverpool. The practice here is to insert loading coils one mile apart on cables and eight to ten miles apart on aerial lines. For submarine telephony a loaded cable 125 miles long is to be laid from England to Holland—hitherto the longest loaded submarine cables have been the Anglo-Belgian one, forty-eight miles long, and the cable to Ireland, sixty-four miles long. In concluding his discourse, Prof. Fleming predicted that when telephony between England and America is possible, it will be by wireless, and not by cable.

The Return of Patents, in respect of which royalties are payable by the Post Office to the Marconi Co., and the areas in respect of which they run, which was ordered to be printed in August last, is now available, and can be purchased through the usual channels for ½d. The number of patents in the list is thirty-five. According to the Marconi Co., royalties are payable on all these in Great Britain, on twenty-seven in Egypt, on nine in Singapore and Lahore, on five in the Transvaal, and on nine in India. It is pointed out in the memorandum that in no station will all the patents be used, nor is it certain which will be used until further progress has been made with the construction of the stations. In Egypt there is no law of patents nor copyright.

It was decided in the United States Council Court recently that the National Electric Signalling Co. (Fessenden's system) had infringed the patents held by the American Marconi Co., corresponding to Mr. Marconi's British Patent No. 7,777/00, and to Sir Oliver Lodge's British Patent No. 11,575/97.

The Persian line between Ahvaz and Mohammarch was down for a short while on March 28th, and failed again on March 31st. Recently, also, some derangement of the Key West route occurred.



## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published March 26th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

30,107/12. **Variable-Speed Dynamos.** B.T.-H. Co. (*G. E. Co., U.S.A.*). To maintain constant pressure across a variable speed dynamo a differential exciting winding is provided, and a resistor of carbon, tungsten, or tantalum, containing a material such as boron, having a marked negative temperature resistance coefficient, is used in series with one winding. There are several modifications. Eight figures.

5,292/13. **Discovery of Minerals in the Earth.** A. WILLIAMS. An electrode is fixed in the ground, and is connected through flexible wire and a galvanometer to a probing spike or drill, which, when it comes in contact with the hidden mineral, completes the circuit—the electrode and the mineral itself constituting a primary cell.

6,806/13. **Regenerative Motor-Control.** CROMPTON & Co. and H. BURGE. A motor is connected in series with a motor-generator across the line. There is a field winding on the motor through which the current is automatically decreased or increased as the motor speed rises or falls. This winding is connected between one side of the line and a choking coil across the armature, or through a slip ring to the armature. Two figures.

7,311/13. **Cable Armouring.** W. S. SMITH and H. J. GARNETT. The armouring of cables is protected against corrosion by gas pitch from which the free carbon has been removed by dissolving in toluol, filtering, and evaporating in a vacuum.

10,077/13. **Oil-immersed Switchgear.** A. E. G. Auxiliary spaces, provided with safety valves, and filled with air or inert gas, are in direct communication with the liquid. On an increase in pressure, due to gases formed during switching, the gas in the auxiliary space is compressed at first, but then drives the combustion gases out through vents provided for the purpose. One figure.

11,997/13. **Electricity in Agriculture.** R. M. MIES. Plants, fields, sown seeds, crops, &c., are treated with chemically manuring and sterilising substances, and simultaneously or subsequently a high-pressure A.C. current is applied. The pressure is automatically kept from exceeding about 80,000 volts and the current 30 milliamperes by the construction of the induction coil through which the energy is supplied. Electrodes are used to enclose uniformly the plants, crops, &c. Five figures.

12,246/13. **Sad-Irons.** W. H. DALTON. Flat heating coils are embedded in heat-conducting cement, while a layer of non-heat-conducting cement is used at the top. Five figures.

24,458/13. **Wireless Telegraphy.** J. W. LEE and J. L. HOGAN. The invention relates to an improvement on Feasenden's heterodyne receiver in that the artificial waves are controllable by combining the incoming and auxiliary waves before the energy reaches the receiver, and thereupon operating a detector and indicator. Five figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** DEBAUGE [Pumping apparatus for manufacture of tubes, wires, cable casings, &c., from molten lead or alloys] 5,639/13; SUNDERLAND [Bonding armoured cables] 15,286/13; JEFFERY [Porcelain] 16,396/13.

**Dynamos, Motors and Transformers:** NEWTON BROS., 5,926/13. **Electrometallurgy and Electrochemistry:** SCOTT [Starting furnace arcs] 6,136/13; SERPEK [Aluminium nitride] 24,731/13. **Heating:** BRIT. ELEC. HEATER Co. and KRATT [Liquid] 12,129/13.

**Ignition:** SWINNEY [Sparking-plug cleaning] 5,745/13; MALE [Sparking-plug socket] 18,728/13; HEINS [Engine starting] 24,457/13; FREIBERG and PETZSCHE [Sparking plugs] 357/14.

**Incandescent Lamps:** WALLING [Sintering metals] 14,795/13. **Instruments and Meters:** B.T.-H. Co. (*A.E.G.*) [Recording devices] 5,734/13; SIEMENS BROS. (*Siemens & Halske A.-G.*) [Feed control for recording instruments] 14,951/13.

**Switchgear, Fuses and Fittings:** WIDMER [Combined globe and reflector for incandescent lamps] 5,909/13; BENDIXEN and GONDROP [Time switches] 6,169/13; HART [Switches] 340/14; BIRCH [Conduit connections and fittings] 1,729/14.

**Telephony and Telegraphy:** SIEMENS & HALSKE A.-G. [Automatic telephony] 3,344/13, 3,431/13, and 12,060/13; KENNEDY

and TURNER [Telephony] 6,369/13; HASTINGS [Selective telephony] 9,986/13; DITCHAM and GRINDELL-MATTHEWS WIRELESS TELEPHONE SYNDICATE [Wireless telephony] 12,076/13 and 12,157/13; TELEPHON APPARAT FABRIK E. ZWIETUSCH & Co. [Telephony] 14,229/13.

**Traction:** SNOW [Communicating with and stopping railway trains] 5,854/13; ALLARD [Train signalling and control] 6,186/13; HUDSON [Automatic train stops] 14,336/13; Soc. d'ELECTRICITE NILMELIOR and COLAS [Railway signalling] 16,641/13.

**Miscellaneous:** HAY and SULLIVAN [Resistances] 22,375/12; KOLBASIEFF and BEKLEMISCHEFF [Detecting ice-burys] 5,887/13; CRAIG and PETER SPENCE & SONS [Finely divided copper] 6,161/13; BLADON [Battery lamps] 6,602/13; WOODS [Annealing wire] 12,872/13; SIEMENS & HALSKE A.-G., BANGERT and UTECHT [Exciting Röntgen-ray tubes] 13,903/13; FRIEDR. KRUPP A.-G. GRUSONWERK [Magnetic separators] 14,427/13; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Boron nitride] 16,468/13; SIEMENS BROS. (*Siemens & Halske*) [Lamp signalling] 17,713/13; RUSTON [Clocks] 19,268/13; FRESE [Wire-drawing] 19,276/13; ARCHIBALD BAIRD & SONS and BAIRD [Bell signalling] 28,350/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** WITTRIN [Fixing cable insulators] 5,240/14; REGAL [Insulators] 5,459/14.

**Dynamos, Motors and Transformers:** KETTERING, 4,762/14; HOLM-HANSEN [Compound transformers] 5,511/14; HERMANN [A.C.-D.C. transformer] 5,779/14.

**Ignition:** KETTERING, 6,072/14. **Switchgear:** A.E.G. [Connection of a number of conductors to one bus-bar] 5,467/14.

**Telephony and Telegraphy:** BETULANDER [Selectors] 4,819/14; LEIMBACH [Wireless] 5,535/14.

**Miscellaneous:** FRIEDR. HESSER MASCH. A.-G. [Release for drawing-off apparatus composed of weighing and measuring devices for use with goods-packing machines] 3,004/14.

The following Amended Specifications may now be obtained:—

**Electrochemistry:** H. M. DU BOIS [Electrolysis and electrolytic cells] 1,420/13 and 1,439/13.

### Amendments to Specifications

19,257/12. **Clocks.** L. J. ARON, C. WIENER, and the X.L. ELEC. Co. Owing to the extended investigation under Sect. 8 of the Act a disclaimer has been added to the specification, which describes an electrical driving gear for clocks, &c.

### Grant of Patent Allowed

22,041/12. **Tungsten for Drawn-wire Lamps.** H. LEISER. The Comptroller has allowed the Grant, in spite of the opposition by the B.T.-H. Co., of this Patent (ELECTRICAL ENGINEERING, Dec. 25th, 1913, p. 728, Vol. IX.).

### Grant of Patent Refused

2,546/13. **Mine Signalling.** J. CLOSE. The Comptroller has now refused the Grant of this Patent.

### Appeal from Comptroller's Decision

25,606/12. **Time Elements for Circuit-Breakers.** J. G. STATTER. An appeal has been lodged by the opposers against the Comptroller's decision to Grant this Patent.

### Appeal against Grant Withdrawn

20,207/11. **Sparking Plugs.** H. G. LONGFORD, W. W. LONGFORD, and W. A. CLARK (Sphinx Mfg. Co.).

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems:** W. A. STEVENS, 26,674/08.

**Dynamos and Motors:** C. DE KANDÓ [Stator winding of railway motors are embedded in an insulating material, which is melted and escapes, to be replenished, if the temperature rise is too great] 25,759/05.

**Electrochemistry and Electrometallurgy:** A. HIORTH [Induction furnaces] 28,370/06.

**Storage Batteries:** B. J. B. MILLS (*T. A. Edison, U.S.A.*) [Cleaning iron strips for the Edison battery] 26,947/04; [Construction of the Edison battery] 26,949/04.

**Switchgear, Fuses and Fittings:** CALLENDER'S CABLE Co. and J. C. A. WARD [Contacts for switches and fuses] 25,614/05.

**Miscellaneous:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Electrolytic lightning arresters] 27,224/07; C. DAVIS [Electrically firing torpedoes] 22,376/08.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Published on the First Thursday of each month

### AUTOMATIC CONTROLLERS FOR MINES

IN the course of a Paper dealing with Automatic Controllers for Mining Work, by Mr. G. W. Humphry, read before the Association of Mining Electrical Engineers (South Wales Branch) on Saturday, March 21st, the author described a motor starter which had met with success in works and mines. It was necessary that motors working mine machinery should continue to run under all conditions except heavy overloads. The pressure variations were sudden and heavy, and if the no-voltage mechanism failed to release on a drop, then the sudden return of the normal or higher pressure was likely to cause the motor to flash over. With automatic starters a pressure relay could be used which, on a pressure-drop of about 10 per cent., would drop out, opening the control circuit of the accelerating switch, which dropped in turn and cut into circuit the heavy duty starting resistance. This should have a capacity for continuous service at low pressure. The motor should then run at a low speed, until, when the pressure had again reached 90 per cent. of the normal, the relay pulled in again, cutting out the resistance and permitting the motor to accelerate to full speed. For motors for haulage and pumps, &c., above 75 h.p., contactors should be used. The period between the working of one contactor and the next, which governed the rate of acceleration of the motor, was controlled by series relays or by the pressure-drop in the controller resistance. The latter was the simplest, most effective, and most satisfactory where the pressure of the supply could be relied upon for steady regulation, but where, as was generally the case in mines, there were pressure fluctuations of 5 per cent. or more, acceleration by the series relay was essential, and by it close results could be obtained. The author then dwelt on the necessity for protecting the connected apparatus by means of effective safety devices. Limit or relay switches could be so connected in the motor circuit that in case of temporary overloads, all contactors except the first one opened circuit; the whole of the starting resistance was then in series with the motor armature, which continued to rotate slowly until the overload was removed, after which it would accelerate, as in first starting, to normal full speed. This device was of special value in the case of haulages or coal-cutters, as when there was an obstruction, the armature resistance was automatically cut into circuit, the motor slowed down until the obstruction was removed. With a circuit-breaker hand-set relay in circuit, in case of a dangerous overload—such as the derailment of the trams by falls or timber—all the contactors could be made to operate at the same time and completely disconnect the motor from the supply, the blow-out coils promptly disrupting any arc that might arise between the contactor fingers. It was important to observe that the relay was automatically held open until the hand-set relay had been closed and energised, preventing the motor from automatically starting until the normal conditions had been restored and the source of trouble removed.

On the question of machine drive the author said that belt drive, though now generally used, was gradually disappearing. Where the motor was direct-coupled to the machine shaft, two methods of automatic control were generally resorted to in order to avoid the heavy current peaks, and to obtain as nearly as possible smooth running of the machines: (a) By starting and accelerating, stopping at the end of the stroke by dynamic braking, and reversing by applying reversed power to the motor; (b) by disconnecting the motor entirely from the line when the machine was on the point of reversal and immediately applying reversed power. When the master-switch was turned to the "on" position the power was thrown on the motor armature with resistance in series; this was then automatically short-circuited, and the motor ran as a compound interpole, automatically closing the short-circuiting switches of the shunt, and the series fields connected the motor as a shunt machine for constant speed with full shunt. The shunt resistance switch was then automatically opened. This caused the motor to attain its predetermined speed. When the tappet device attached to the planer platen threw the master-switch, all the automatic

switches returned to their original positions, and power was applied in the reverse direction.

The question of the control of A.C. motors was then briefly dealt with. The most common way of obtaining automatic starting was by reduction of the stator pressure by means of resistances, or by the use of auto-transformers for single-phase and squirrel-cage motors, and the insertion of resistance in the rotor circuit of slip-ring machines. Star-delta switches could be used in certain cases, and could also be set for automatic working.

### AN ELECTRICAL WINDING PLANT IN FRANCE

A MAIN shaft electrical winding plant, worked on the Ward Leonard control system with flywheel power equalisation, has been put down recently by the Société Alsacienne de constructions mécaniques, of Belfort, at the Landres iron mine of the Micheville Steel Co. The set has been installed at the head of a secondary shaft, and an electrical system was particularly convenient owing to the establishment of a three-phase generating station to supply current for a large amount of electric pumping which is carried on continuously. Thus the question of generating plant for the winder could be met economically by a comparatively small increase in the size of the main generating sets. The winding plant is designed to raise 3 tons of ore from 760 ft., and to make ninety trips per hour, with an actual winding time of 30 secs. The system chosen, although involving a motor-generator with a large flywheel, gives excellent control, and shields the generating plant from peaks in the load, both matters of importance, considering the frequency of the trips. There are two conical drums coupled together and direct driven by a single continuous current main winding motor, separately excited and supplied with current at a variable voltage from the flywheel motor generator. The whole control is by one lever, which varies the excitation of the flywheel generator, and by this means regenerative braking as well as speed control is obtained. A full equipment of mechanical brakes worked by compressed air is also provided, and the usual very complete safety devices are fitted, by which the brakes are applied in event of failure of the compressed-air supply, overrunning, failure of current, or increase in the cage speed above a certain value. There is complete interlocking between the electrical and mechanical brake gear. The main control lever is also interlocked with the depth indicator in such a way that it is gradually returned automatically to the off position, slowing down and stopping the machine at the end of the travel, even if the driver fails to do so.

The main winding motor is connected to the drums by a coupling that can easily be dismantled. It is fed at voltages varying from 0 to 500, and runs at a maximum speed of 41 r.p.m., giving outputs up to 1,000 h.p. It is fitted with commutating poles, and is separately excited from the station bus bars at 500 volts. The equalising motor-generator consists of a 450-h.p. three-phase induction motor running at 485 r.p.m. maximum speed, driving the variable voltage continuous current generator, which feeds the main winding motor. The flywheel, which weighs 15 tons, and is made of one solid steel casting, is coupled to these machines by a flexible coupling, and the automatic slip regulator allows for a reduction of speed to 410 r.p.m. to enable the flywheel to give out its stored energy when required. In event of a breakdown of the flywheel motor-generator, it is possible to run the winding motor direct from one of the two 600-kw. 500-volt continuous-current steam-driven sets in the generating station. When this is done, the set is taken off the bus bars and connected straight on to the winding motor, and a special rheostat is used in its field circuit. This can be connected up so as to be worked by the same control lever that normally regulates the motor-generator excitation, so that the method of control is in no way altered. The plant, which is described in *L'Electricien* and elsewhere, is reported to be working with great regularity, and the perfection of the control apparatus renders it possible to maintain the rapid rate of working of ninety-five trips per hour without difficulty.

## PATENT LOUD SPEAKING TELEPHONES

COMPLETE INSTALLATIONS FOR

**WARSHIPS, MERCANTILE VESSELS,  
MINES, POWER STATIONS, ETC.**

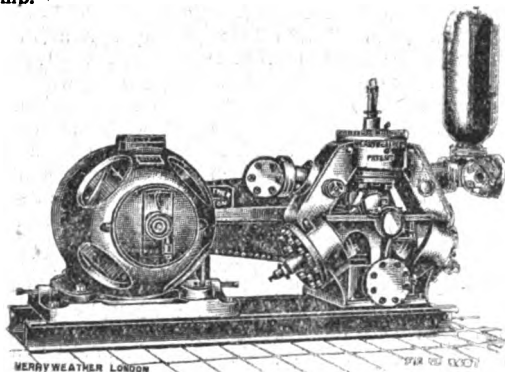
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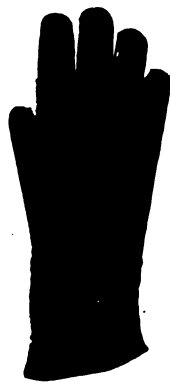
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## ELECTRIC WINDING AND ROLLING MILL DRIVE

A PAPER on "Electric Winding" was read by Mr. J. Gillespie recently before the East and West of Scotland Branches of the Association of Mining Electrical Engineers, and before the Warwickshire and South Staffordshire Branch on Saturday last. The author began by dealing with the advantages of electric power for all purposes in collieries, and quoted the results of tests conducted by the Coalowners' Institute of the Westphalian district of Germany, in association with the Boiler Inspection Society of Dortmund, which were very favourable to the Ilgner winding sets used in the tests. The author then referred to the Ilgner-Ward-Leonard winding set installed at the Cobbinshaw Pit of the Tarbrax Oil Co. (now absorbed by the Pumpharston Oil Co., Ltd.) by Bruce Peebles & Co. (see ELECTRICAL ENGINEERING, Feb. 21st, 1907, p. 332, Vol. I). Later an Ilgner set was installed at the Breich Pit of the Pumpharston Oil Co. by Siemens Bros. Dynamo Works. The braking is carried out by a compressed-air engine acting against a counterweight, the pressure tending to keep the brakes in the "off" position. During ordinary routine winding the brake is controlled by the engineman through a hand-lever. Should the emergency brake come into operation at any time the connecting lever opens a switch in the main generator field, and thereby prevents the motor from being driven against the brakes. The emergency brake comes into operation on failure of the power supply, of the air pressure, or of an overwind, as well as by the engineman. A limit switch at the pit-head is connected to a trip lever which may be operated by either cage overrunning the deck by about 2 ft. By means of a speed-limiting switch at the pit-head, the pit-head man can limit the speed of the cage for winding men to half that for winding coal by limiting the controller handle to half-range. The torquing motor is energised from three transformers whose primaries are in the main motor circuit. Acting against a counterweight, it is called upon to close a relay circuit, the actual insertion of the resistance being performed by a small D.C. motor withdrawing the dippers from a liquid starter. The exciter-generator is included as part of the motor-generator set, which is made up of the main induction motor, variable-pressure generator, auxiliary generator, and flywheel. By this arrangement several complete winds may be undertaken in the event of a power-house or line breakdown, as there is sufficient energy stored in the flywheel. The fluctuations of the flywheel speed are compensated for by an automatic pressure regulator inserted in the field circuit of the auxiliary generator. The whole winder, including the motor-generator, is protected against over-speeding, either accidental or through neglect on the part of the attendant. The depth of the shaft is 72 fathoms, and the time per wind is twenty seconds. The indicator pillar has attached to its worm screw a series of tappets, which act upon a lever fitted with a freely-moving roller. Upon the tappets moving in a downward direction toward the completion of a wind, they press upon the roller, bringing the controller and its handle to the zero position. An additional trip cuts off the current and applies the brake, should for any reason the tappets fail to bring the cages to rest. The working is so smooth that there is no necessity to apply the brake at the completion of a wind. The cost of the equipment was about £3,000, and, when winding coal two shifts per day, 120,000 tons per year, or 37 tons per hour, can be drawn. Taking interest at 5 per cent. and depreciation at 10 per cent., the author obtains a cost of 2'35d. per ton raised, compared with 2'62d. with steam winding. It appears also that the electric winder could draw much more coal per wind than it does at present.

Another Paper dealing with winding and rolling mills is "Power Economies for Intermittent Loads," read before the Rugby Engineering Society, by Mr. E. Ivor David. The author dealt first with steam and electric winding, Ward-Leonard system, and by means of examples showed that commercially electricity for main winding deserves consideration in every case, and in most shows a decided advantage. On the question of rolling-mill drive the author showed that in the case of a tin-plate mill driven by a 160-I.H.P. compound engine costing, complete, about £3,400, an induction-motor drive could be substituted at a cost of about £4,300. Contactor-type slip regulators, working in 1/50 sec. are available, and these have proved sufficient for the most severe rolling-mill purposes, but ordinary motor-driven slip regulators of the liquid or metallic type are somewhat sluggish in their action. D.C. motors are also used for driving continuous-running rolling mills. When used in conjunction with flywheels, the addition of series windings to the main field produces the necessary speed drop with increase of load. In

merchant mills, which usually roll a great variety of sections, it is an advantage to be able to vary the speed of the mill motor, and D.C. motors are best for this purpose. The driving of a 36-in. cogging mill by steam and by induction motors is then considered. The examples given show that the electric motor, owing to its high and uniform starting torque, high overload capacity, reliability, and small size and weight, compared with other engines, is particularly adapted to reversing or intermittent loads. In some cases electric equipments are slightly higher in first cost than plain steam equipments, but wherever electric power can be purchased or produced at less than 0.35d. per unit, and in many cases up to 1d. per unit, reduced running costs can be proved.

The author concludes: "In every case where the electric motor drive for rolling mills or winding engines has been installed, an increase in output over steam engines of similar capacity has been obtained. The numerous safeguards against overload or abuse which can be introduced into electrical equipments, have proved of such value that no serious breakdown of electric motors in this service has been recorded."

### ELECTRICAL MINING AND METALLURGICAL PATENTS OF MARCH

#### Mining.

THE following patents, the specifications of which were published by the Patent Office during March, are of peculiar interest to mining electrical engineers:—No. 17,816/13, by R. Nicholas, of Treorchy, South Wales, deals with a method of adapting mechanical signalling to conform with the Act of 1911. A contact-maker is fixed to the "rapper" or "knocker," so that when a signal is pulled from the bottom of the mine the same pull completes an electric circuit reproducing the signal in the winding-engine house. The contact-maker is made of two halves of an insulated splitting. Between these is a movable pin with a cone-shaped head, all enclosed in a watertight box. No. 5,467/13, by A. Philip and L. J. Steele, of Portsmouth Dockyard, relates to catalytic gas detectors, and covers the use of resistances joined to a catalytically-active and to an inactive wire, connected as a bridge, and a sliding connection, adjustable, for example, by a screw, between the resistances and the battery or indicating instrument, as a means of obtaining an initial zero reading.

#### Metallurgical.

These patents are of special interest to electro-metallurgists:—According to specification No. 3,554/13, by G. H. Benjamin (New York), the manufacture of cement steel is effected by heating the iron or steel by alternating current of 25 or more cycles per sec. frequency in the presence of gas under pressure containing carbon. Specifications Nos. 22,744/13 and 22,745/13, by N. V. Hybinette (Christiania, Norway), deal with the electrolysis of copper solutions containing iron. According to the first specification, the electrolyte is circulated between the anode compartment and the copper leaching tanks, so that the copper to be recovered passes to the cathode through a porous partition. The second specification deals with a process for the extraction of copper from material containing it partly as oxide and partly as sulphide. After leaching with an acid sulphate containing much iron, of which only a small quantity is oxidised to the ferric state, then electrolysis the solution in cells without diaphragms, and interrupting the electrolysis before sufficient iron is oxidised to ferric sulphate as to interfere seriously with the plating, the solution is again leached and the copper left in the ore by electrolysis by the use of some of the solution, previously oxidised so as to contain a larger quantity of ferric sulphate, in an electrolytic cell with diaphragms.

Specification No. 25,163/13, by the British Thomson-Houston Co. and C. H. McCarthy-Jones, deals with rolling-mill and winding-engine driving. The invention consists in the use of a Tirrill regulator to act directly on the fields of a motor-generator set. In a previous specification the system described was the same, except that an auxiliary machine was used between the regulator and the motor-generator.

The following three patents relate to welding. No. 27,496/12, by E. H. Jones (London), relates to a method consisting in connecting the work to one pole and a single water-cooled welding roller to the other. The welding current is supplied at a low pressure, e.g., at about 2 volts. No. 19,512/12, by R. Mack (Germany), relates to a single-phase low-pressure

## FOR BRITISH MANUFACTURED PAPER INSULATED CABLES

# THE UNION CABLE CO., LD

DAGENHAM DOCK,  
ESSEX.

transformer for welding, smelting, &c., consisting of a secondary in the form of a protective casing completely enclosing the core and primary; and No. 24,472/13, by J. M. Yount, T. Finigan, and E. S. Brannaman (U.S.A.), relates to an apparatus especially intended for welding railway rails. A skeleton framework is mounted on wheels and has resistance elements arranged in groups in series. The welding tool is connected at points on the resistances, according to the current required. An enclosure is also provided.

In specification No. 14,426/13, Friedr. Krupp A.-G. Grusonwerk (Germany) claims a magnetic separator in which the material to be treated travels across the field in the same direction, relatively to the co-operating magnet pole, as the travel of the surface to which the particles are attracted. These are sub-divided by planes parallel to the direction of travel of the material into fields of different strength.

**The Association of Mining Electrical Engineers.**—Among recent Branch meetings during the last month was a combined meeting on March 7th of the Yorkshire Branch with that of the Association of Colliery Managers, when a Paper by Mr. A. Anderson on "Electrical Transmission in Mines" was discussed. The Paper dealt largely with underground work. A meeting of the West of Scotland Branch was held on March 20th at Glasgow, when Mr. C. E. Hart read a Paper on "Rock Drills," and Mr. J. Gillespie's Paper on "Electric Winding in Collieries" was discussed. The last meeting of the Branch will be the annual general meeting on April 22nd. At a meeting of the East of Scotland Branch on March 20th, Mr. S. P. C. Kinlen's Paper on the "Choice of Electrical Machinery for Use in Mines" was discussed. The branch visited the electrical winding gear of the Pumpherstone Oil Co. at Midcaldor on last Saturday.

**"Waste" Power.**—At a meeting of the Cleveland Institution of Engineers recently Mr. J. H. Harrison read a Paper on "Some Notes on the Manufacture of Iron and Steel," in which he called attention to the large amount of surplus power available from blast furnace gas in the district, which was now being utilised by the Cleveland & Durham Power Co. Something like 1,750,000 units per week were being generated in this way at a lower cost than anywhere in the United Kingdom, with great benefit to the district. He looked forward to a further movement in the direction of linking up the smaller ironworks in this way.



## “ELECTRICAL ENGINEERING” TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 199. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**CALENDAR.**—A useful calendar, with a table of equivalents of British and foreign measures, weights, and moneys is to hand from Rosenblum's Translation Bureau (26 High Holborn).

**VACUUM CLEANERS.**—A list from the Electric Suction Cleaner Co. (151 Queen Victoria Street, E.C.) describes the Frantz electric suction cleaner, which is of the self-contained domestic type, with the motor and suction fan mounted in the same casing as the nozzle, which also contains a revolving brush. The apparatus is light and compact, and can either be wheeled about complete for carpet cleaning, &c., or used in conjunction with a flexible hose.

**SIGNALLING BATTERIES.**—A leaflet from Siemens Brothers & Co., Ltd. (Woolwich), gives particulars of a form of large Leclanché cell specially designed for use in connection with railway-track circuit signalling.

**HEATING AND COOKING.**—We are in receipt of a booklet from Ferranti, Ltd. (Central House, Kingsway, W.C.), suitable for distribution among likely consumers. It is of convenient size for enclosing in the ordinary business envelope, and so can be sent with accounts, &c. The company intimates that it will be pleased to supply quantities of the booklet to contractors and supply authorities for this purpose. On the front is a picture of two little boys in a bathroom warming before a Ferranti Fire, and inside the advantages of electric heating and cooking are given, with calculations showing a monetary gain in the latter case.

**SCHOLEY'S MAGAZINE.**—The March issue of this interesting little publication commences with an illustrated sketch of the career of Mr. J. F. C. Snell. A description follows of an automatic lift installation, and some interesting particulars are given of the tool steel gears and pinion which the firm are supplying to the London & South Western Railway, which are of much larger size than has been the usual practice hitherto, the gear-wheels being 30½ in. in diameter. Scholey & Co. have also the order for the gears for the London & North Western Railway electrification.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**TELEPHONES AND BELLS.**—The Sterling Telephone & Electric Co., Ltd. (210-212 Tottenham Court Road, W.), has just issued an illustrated catalogue of 160 quarto pages dealing with telephones for every conceivable purpose, bells, indicators, fire alarms, batteries, wires, &c. The Sterling "Primax" system of automatic interphones is included. This system is one in which a central battery is used, and it is claimed that induced cross-talk is so far eliminated that in a system of 30 lines the maximum number of conversations can be carried on simultaneously without confusion. Only two additional common wires are required in the cable. Replacing the receiver or hand-set automatically disconnects the switch, and it is only necessary to move the line selector when making a call. A new set named the "Factory" interphone has been designed to stand rough handling in works, engineering shops, railway yards, &c. Other items include secret interphones with lamp signals, a comprehensive range of telephones and bells for use in mines as well as blasting sets, all complying with the Home Office requirements. Finally, mention may be made of the new range of cables for interphone systems, with enamelled wire conductors, a special clock for timing trunk calls, a conversation counter for checking message rate accounts, the "Ferro-Case" instruments, and the G.P.O. sets.

**"THE E.C. JOURNAL."**—The March issue of the interesting little magazine published by the Electrical Co., Ltd. (Charing Cross Road, W.C.), describes some small electrically-driven pumps, and gives some views of the works where the Company's small motors, &c., are made. Some candle-power and consumption curves relating to the Nitra or half-watt lamp are given, and other subjects dealt with are electric signs and meters. There is also an extensive list of motors which the Company have in stock in London.

### ELECTRICAL EQUIPMENT OF A BAKERY

THE application of electric power and lighting offers particular advantages in the baking industry, on the grounds of cleanliness, convenience, and economy.

An interesting example of an electrically-worked bakery is that of Messrs. J. & B. Stevenson, at Cranstonhill, Glasgow. The first move in the conversion to electric power was the installation in one of the bakehouses of a 60-B.H.P. motor by the British Thomson-Houston Co. (Rugby), to replace a steam

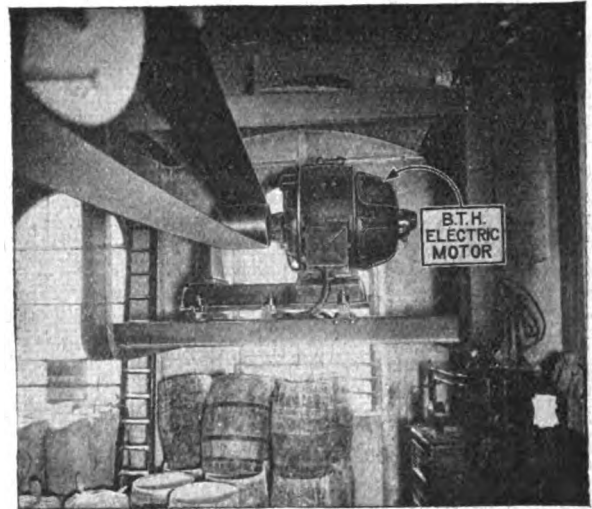


FIG. 1.—60-H.P. MOTOR DRIVING KNEADING MACHINE, &c.

engine and boiler, thereby saving a great deal of floor space. This motor is suspended by steel hangers from the ceiling of the ground-floor, and connected by belting and counter-shafting to two groups of machines consisting, respectively, of two kneading machines, one dividing and handling machine, two stirrers, and a ventilating fan on the ground-floor, and two kneading machines and one dividing and handling machine in the basement. It is ultimately intended to

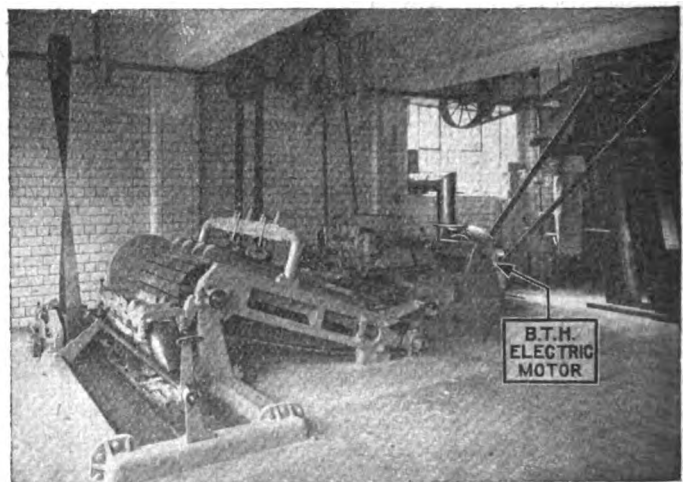


FIG. 2.—30-H.P. PIPE-VENTILATED MOTOR DRIVING KNEADING MACHINE, FLOUR SIFTER, AND CONVEYOR.

instal a duplicate motor on a third floor, where it will replace a gas engine driving a lift, two kneading machines, one stirrer, a fruit cleaner, and automatic machines, with provision for its being connected to the main shafting on the lower floors.

In the latest premises of this firm two floors are com-

pletely equipped with electrical drives, and two others are to be similarly equipped at a later date. Two motors are used, of 30 and 12 B.H.P. respectively. These were also manufactured by the British Thomson-Houston Co., Ltd., and are of the pipe-ventilated type, specially designed for use in a dusty atmosphere.

The first group of machines driven by these motors consists of two kneading machines, flour-sifter with elevator and conveyor, and a stirring machine; and the second group, of automatic plant—chaffing machines, prover, and handing-up machines. By means of a clutch on the counter-shafting the two groups of machines may be connected together, so that either motor alone may be utilised to drive the automatic plant and a limited number of the other machines. Substantial terminal boxes are fixed to the motor frames, and the whole of the wiring between the motors and control panels is enclosed in metallic tubing. The control panels, which are fitted with no-volt and overload releases, interlocking shunt regulators, and fuses, thus effectively protecting the motors from injury due to careless starting, &c., are enclosed in glass-fronted cast-iron cases through which the control handles project. Special push-button switches are fitted beside the handing-up machine of the automatic plant to enable the attendant to stop the machine immediately if necessary.

The supply is obtained from the three-wire system of the

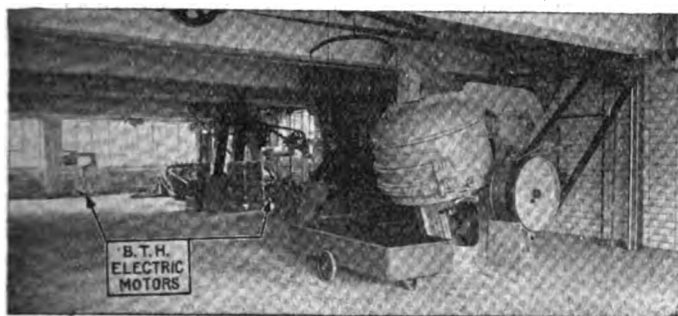


FIG. 3.—PIPE-VENTILATED MOTOR DRIVING KNEADING MACHINES, AUTOMATIC PLANT, &c.

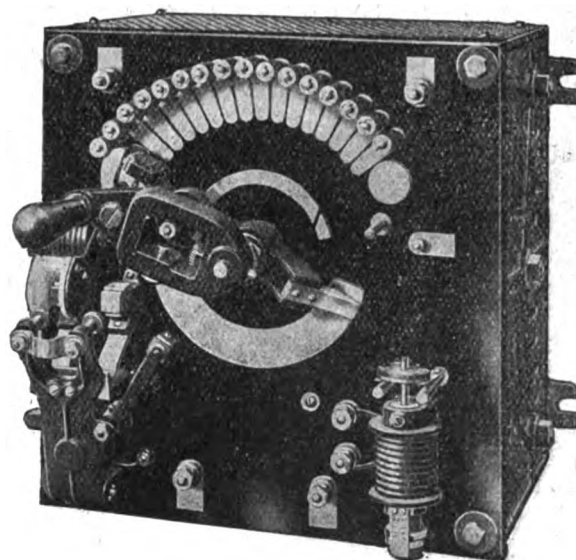
Glasgow Corporation. The incoming leads are connected to a main switchboard in the basement, where connections may be made to distribution boards situated at convenient central positions on each floor. Satisfactory lighting is obtained by the use of 30-watt 250-volt metal filament lamps connected between the outers and the neutral, while the motors are connected across the 500-volt outers. In addition to the fact that the electric drive offers the best conditions for clean and efficient work, the low cost of such an installation as that described above should be a strong recommendation for its adoption. It is always difficult to obtain reliable information as to the relative cost of various methods of power supply, but, as a guide to firms who may be considering the installation of electric equipment, we refer to statistics issued by the Corporation Electricity Department relating to various trades in Glasgow and Birmingham, where it is mentioned that the cost of current supplied to bakeries in these towns during 1913 was as low as £1 19s. and £1 16s. 7d. respectively per horse power installed.

The above schemes were adopted on the advice of Messrs. J. & B. Stevenson's Consulting Engineers, Messrs. James E. Sayers and Caldwell, of Glasgow, who prepared the specifications and supervised the work.

### A "FOOL-PROOF" INCHING STARTER

WE recently had the pleasure of inspecting a new design of "fool-proof" inching motor-starter, which we understand has been patented, during the course of a tour round the works of the Electrical Apparatus Co., Ltd. (Vauxhall Works, South Lambeth Road, S.W.), where we saw a quantity of unit-type ironclad switchgear for mines in all stages of manufacture, lift controllers, meters, &c. In the case of the motor-starter, the automatic features are obtained by means of a no-volt and overload release circuit-breaker, interlocked in such a way that the motor cannot be started unless all the starting resistance is in circuit. This eliminates the ordinary no-volt coil and spring return. The main circuit is always made and broken by a contactor of ample size, which is provided with two carbon breaks and a magnetic blow-out. The main lever (see illustration) may be con-

sidered as a plain starter without any automatic features and without an "off" position. This lever carries an insulated plunger which slides over a small sector on the starter front. The upper end of this insulated plunger carries a copper roller. Superimposed upon the main lever, and pivoted on the same spindle, is a cradle which carries the operating handle, and is free to move through a small arc. This superstructure carries an uninsulated plunger, which, when the handle is moved forward, makes contact with the insulated copper roller on the main lever. A small spring tends to hold these two contacts apart, so that they will only make contact while the handle is being moved or held in a forward direction, and will immediately open when the handle is released. A heavy pressure can be maintained between the standing lever and the segments, of which there are a large number. As the main circuit is always made and broken on a separate contactor, there is no sparking on the starting contacts. A carbon roller is provided on each segment, but this is only for the purpose of taking the small spark when advancing from step to step. The circuit cannot be broken on the segments, and it is impossible to move the starter arm backwards in the slightest degree without first opening the contactor. If the starting handle is let go at any period



"FOOL-PROOF" INCHING STARTER.

of starting, the contactor instantly opens and the motor stops. The no-volt and overload releases are independent of the starter arm, and out of control of the operator. The starter therefore embodies the function of a loose handle no-volt and overload release circuit-breaker. If at any period of starting or running the supply fails or the overload release operates, the contactor opens, as above described, and it is impossible to start again until all the starting resistance has been re-inserted by bringing the starter arm to the "off" position. The contactor current is always reduced to its "holding" value by a small copper-carbon switch worked by the contactor itself. Furthermore, it is not possible to burn out the contactor solenoid by staying too long on the starting position, as the action of the switch is instantaneous. Apart from the slate base and starting handle, there is no insulation on the starter proper, with the sole exception of an ebonite bush  $\frac{1}{4}$  in. thick round a small plunger. In the foregoing description only one contactor has been referred to. By adding another one in the other pole a complete panel is obtained with full protection, but only one handle for operation. Some of these starters are already in practical use, and their many important features render their investigation by users of this class of apparatus desirable.

**Half-Watt Lamps for Street Lighting.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), point out that the Metropolitan Electric Supply Co. may lay claim to the first half-watt installation for street lighting in London, as previous to January 16th they installed a 105-volt 1,500-watt Osram half-watt lamp at the corner of Vernon Place and Southampton Row, W.C. The lamp is contained in a lantern originally used for a cluster of three standard tungsten lamps, a new reflector having been fitted to accommodate the single unit. These lanterns were illustrated in *ELECTRICAL ENGINEERING*, Vol. VIII., page 633, November 14th, 1912. The result is extremely good and the illumination remarkable when compared with the high-pressure gas lighting in the vicinity.

**MICA** BRITISH MICA CO., LD  
*Contractors to  
H.M. Government.*  
Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—405 P.O. Putney  
Tele.—"Micamini," London.  
**MICANITE**  
Plate Tubes,  
Rings, &c., in

**GLASS TUBES  
AND RODS**  
FOR ELECTRICAL PURPOSES  
GUILBERT-MARTIN  
9, Edmund Place, LONDON, E.C.

**WERTHS & CO.**  
41, Aldersgate Street, LONDON, E.C.  
**VULCANWAX**  
THE BEST INSULATING AND IMPREGNATING  
MATERIAL FOR CABLES AND WIRES

**James Macintyre & Co Ltd**  
Manufacturers of  
**PORCELAIN**  
**INSULATORS**  
of every  
description  
Washington Works, Burslem.

## Half Watt Postcards

Sample and Prices  
-on Application -

Kilowatt Publishing Co., Ltd.,  
203 Temple Chambers, London, E.C.

## F. WIGGINS & SONS,

FOR **MICA** INSULATION

102, 103 & 104, MINORIES, LONDON.

## INDIRECT LIGHTING

THE objection has sometimes been raised in the case of indirect lighting fittings of the suspended bowl type that the unilluminated under-side of the bowl makes an unsightly dark spot amid the uniform illumination. The British Thomson-Houston Co. (Mazda House, 77 Upper Thames

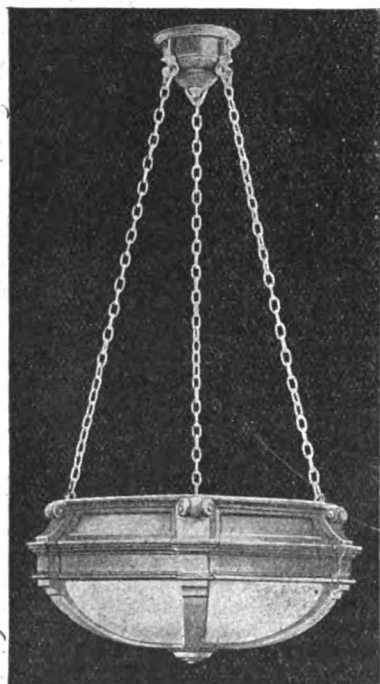


FIG. 1.—LUMINOUS BOWL INDIRECT LIGHTING FITTING.

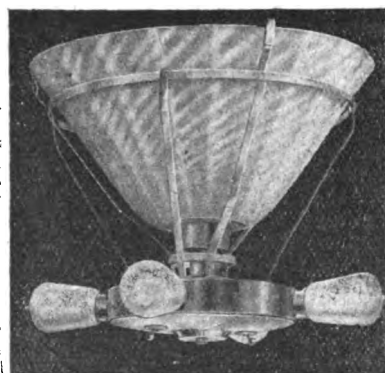


FIG. 3.—INTERIOR OF STANDARD, SHOWING INVERTED REFLECTOR AND LAMPS FOR DIRECT ILLUMINATION.



FIG. 4.—TABLE STANDARD FOR COMBINED DIRECT AND INDIRECT LIGHTING.

Street, E.C.) has now introduced some indirect lighting fittings in which this objection is entirely done away with by having the lower part of the bowl of delicately-tinted translucent glass illuminated by a small auxiliary lamp within the fitting. The direct light given in this way, amounting

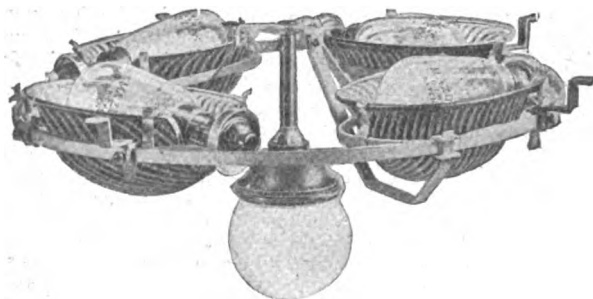


FIG. 2.—ARRANGEMENT OF LAMP AND REFLECTORS.

to about one-tenth of the total, does not materially assist in the general illumination as in true "semi-indirect" lighting,

but improves the appearance of the fitting very much, without sacrificing any of the advantages of fully-indirect lighting. One of these fittings is shown in Fig. 1, and the arrangement of the lamps is seen in Fig. 2. A fine example of this system is to be seen in the lecture theatre of the Royal Institution, where it has replaced a very large fully-indirect fitting.

Hitherto the table or floor standard has not been considered or employed as a general lighting unit, but its usefulness has been confined to the local illumination of a desk or table. The Company, however, has designed a new form of standard lamp, which, while possessing all the features of the ordinary standard lamp, can, if required,

be used for the general illumination of the room. In appearance, it does not differ greatly from ordinary patterns, but concealed within the shade is a single upturned silvered glass reflector. The light is thrown on to the ceiling and reflected down into the room again, in the same way as with suspended "Eye-Rest" indirect lighting fittings. In addition to this indirect unit, there are also two or three moderate-sized lamps uniformly spaced around the pedestal underneath the reflector. These lamps can be used for the direct illumination of a table or desk. These lamps are separately switched, so that it is possible to use the fitting either for indirect or direct lighting, or a combination of both. For example, a low, uniform intensity of light from invisible lamps may be used for the general illumination of the room, while the table or some other selected spot can be more intensely lighted for the purpose of reading or writing. Those who are attracted by indirect illumination, but who have not installed it because of the presumed necessity for changing their ceiling fittings, should welcome the new "Eye-Rest" standard, which can be placed anywhere in the room and connected either to a wall-socket or lamp-holder. Both floor and table standards are made; but, of course, care must be taken to see that they are of sufficient height that from no part of the room can the reflector be looked into.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Bootle.**—Two 500-600-kw. rotary-converters, transformers, and switchgear. Town Clerk. April 22nd.

**Devonport.**—An inquiry was held last week into a loan of £19,466 for electrical extensions.

Tenders are invited for a 1,250-kw. turbo-alternator with condensing plant, and two 500-kw. rotary-converters and switchgear. Borough Electrical Engineer. April 8th.

**Farnworth.**—Switchboard and cables. Borough Electrical Engineer. April 18th.

**Edinburgh.**—Switchboard extension. Consulting Engineer, Sir Alexander Kennedy, 17 Victoria Street, London, S.W. Tenders to Town Clerk. April 20th. (See advertisement on another page.)

**Leeds.**—A scheme involving an expenditure of £200,000 on new plant is now before the Corporation. Mr. C. H. Wordingham has reported upon the Corporation's electricity undertaking, and the new plant is to consist of a 12,000-kw. turbo-alternator, condensing plant, six boilers, switchgear, &c., at the Whitehall Road Works.

**Peterborough.**—A loan of £2,000 is to be taken up for mains, and £600 for services.

**Plymouth.**—Extensions of cable are contemplated in a number of streets.

**Rathkeale.**—The Rathkeale Electric Lighting & Power Co. invite tenders for suction gas-engine plant, dynamos, storage battery, switchboard, cables, and street lighting equipment. Consulting Engineer, L. J. Lawless, 27 Castlewood Avenue, Rathmines, Dublin. April 18th.

**Rawtenstall.**—A Local Government Board inquiry was held last week concerning a loan of £10,000 for electrical extensions.

**Rochdale.**—An electrically-driven crane is required for the electricity works.

**Skelton.**—A Local Government Board inquiry has been held concerning a loan of £9,250 for electric lighting purposes.

**Sunderland.**—The Borough Electrical Engineer has reported replacing the rubber cables on the low-tension system, and also as to further additions to the plant.

**Wallasey.**—Tenders are invited for the plant for the Council's new generating station. April 7th. Borough Electrical Engineer.

**Warrington.**—Twelve months' supply of motors and transformers. Borough Electrical Engineer. April 14th.

**Wigan.**—Three-core feeder cable, transformer and switchgear. Borough Electrical Engineer. April 20th. (See an advertisement on another page.)

Twelve months' supply of general stores. Borough Electrical Engineer. April 18th.

Electrical accessories. Borough Electrical Engineer. April 18th. (See an advertisement on another page.)

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Ballymena.**—Electrical installation at workhouse and hospital. Engineer, F. D. Brown, 93 Ann Street, Belfast. April 11th.

**Clayton.**—Electric lighting of workhouse. North Bierley Guardians.

**Dublin.**—Labour exchange. Office of Public Works, Dublin.

**Glasgow.**—Electric lighting at Haghill Refuse Despatch Works. Town Clerk. April 9th.

**Hastings.**—King Edward Memorial Hospital (£50,000).

**London.**—218 points at Wilson Street School, Islington. Chief Engineer. April 22nd. (See advertisement on another page.)

**Northampton.**—New post office. H.M. Office of Works, London.

**Penistone.**—Electric lighting of workhouse, Netherfield. Clerk, Union Offices, Netherfield, Penistone.

**Salford.**—Headquarters for East Lancashire Territorial Force. Secretary, National Buildings, St. Mary's Parsonage, Manchester.

### Miscellaneous

**Dublin.**—Twelve months' supply of arc-lamp carbons. City Electrical Engineer. April 17th. (See advertisement on another page.)

**Walsall.**—Electrical equipment of new sewage pumping station. Town Clerk.

**Wigan.**—Twelve months' supply of stores for Tramways Department. Tramways Manager. April 18th. (See advertisement on another page.)

## TENDERS RECEIVED AND ACCEPTED

**Aberdare.**—The following tenders have been accepted:—Transformer, H.T. and L.T. switchgear, and instruments, Johnson & Phillips, £231 12s.; cables and feeder pillar, Macintosh Cable Co., £321 15s.

**Barnes.**—A contract has been placed with R. R. Todd for distributor cable. Fifteen other firms also tendered.

**Bexley.**—The following tenders have been received:—500-kw. turbo-alternator, British Westinghouse Co., £3,675 (accepted); Siemens Bros. Dynamo Works, £3,693; Brush Electrical Engineering Co., £3,707; Fraser & Chalmers, £3,727; Willans & Robinson, £3,818; British Thomson-Houston Co., £4,008; James Howden & Co., £4,021; C. A. Parsons & Co., £4,445; Daniel Adamson & Co., £4,751; The A.E.G. Electric Co., £4,841; Belliss & Morcom, £5,064; water-tube boiler, Ross Hotchkiss & Co., £1,700; Stirling Boiler Co., £1,703 (accepted); Howden Boiler Co., £1,720; Babcock & Wilcox, £1,780; Clarke, Chapman & Co., £2,821.

**Birmingham.**—An order has been placed with the General Electric Co. for 25,000 Osram traction lamps for the Corporation Tramways.

**Bootle.**—Contracts for miscellaneous stores have been placed with the following:—Callender's Cable & Construction Co., British Insulated & Helsby Cables, British Thomson-Houston Co., and Armorduct Manufacturing Co.

**Brentwood.**—The contract for the electric lighting of Harold Court Asylum has been placed with H. P. Girling.

**Carlisle.**—The following tenders have been accepted:—One 1,250-kw. turbo-alternator and condensing plant, Maschinenfabrik Oerlikon, £4,908; rotary-converters, British Westinghouse Co., £2,855; high-tension switchgear and feeder panel, British Westinghouse Co., £975.

**Ilford.**—The following tenders have been accepted:—Cables, C. Macintosh & Co.; carbons, Sloan Electrical Co. and Union Electric Co.; house service fuse boxes, W. Lucy & Co. and Reason Manufacturing Co.; incandescent lamps, Cryselco, Ltd., Electrical Mfg. & Supplies Co., and Pope's Electric Lamp Co.; joint boxes, W. Lucy & Co.; main switches, Edison & Swan Electric Light Co.; meters, Ferranti, Ltd., Siemens Bros. Dynamo Works, and Reason Manufacturing Co.

**Nuneaton.**—The tender of the British Thomson-Houston Co. has been accepted for a 750-kw turbo-generator at £3,300. The contract for condensing plant has been placed with Willans & Robinson at £810.

**G.E.C. Works Dinner.**—The Witton Works of the General Electric Co., Ltd., held their twelfth annual dinner at the Old Royal Hotel, Birmingham, on March 20th. Dr. Railing was in the chair, and the attendance numbered over 250. The Works Manager—Mr. W. H. Heaton—proposed the toast of the Company, and Dr. Railing, in responding, emphasised the necessity for co-operation amongst the workmen and staff. Not only for his own sake should a man apply himself to turning out apparatus of the highest possible grade of workmanship, but it was only by producing the highest class of apparatus that they were able to compete successfully with large foreign companies. He announced that the Directors had just voted a sum of £10,000 for the erection of the new club-house at Witton. Mr. Railing also replied, and said that the Board were completing arrangements for a pension scheme for G.E.C. employees. The healths of Dr. Railing and Mr. Railing were drunk to musical honours, and an entertainment followed, contributed mainly by the Witton staff.

**ELECTRICAL MEASURING INSTRUMENTS  
AUTOMATIC BATTERY OUT IN & OUT OUTS  
CIRCUIT BREAKERS.**

**THE RECORD ELECTRICAL Co., Ltd.**  
OAXTON HOUSE, LONDON, S.W.

Telephone: 6700 Victoria.



## LOCAL NOTES

**Atherton: Electric Supply.**—The sub-station of the Council, which is supplied by the Lancashire Electric Power Co., was formally opened last week.

**Blackrock: Electric Lighting.**—After practically arranging with the Alliance & Dublin Consumers' Gas Co. for an electric lighting scheme for this district, the Council has now determined to carry out the undertaking itself.

**Brixham: Nuisance from Electricity Works.**—Last December an injunction was granted against the Brixham Gas Co. for nuisance by noise and vibration from the Company's electric lighting plant. The injunction was suspended until March 17th, but before Mr. Justice Astbury last week it was asked that the injunction be continued another three months to enable the Company to make the necessary alterations. In the meantime the plaintiff in the action is to be paid a small sum in way of compensation for two cottages which he is unable to let owing to the nuisance.

**Dudley: Electric Supply.**—In connection with the recent purchase of the Corporation's electricity undertaking, the Shropshire, Worcestershire, and Staffordshire Electric Power Co. has introduced a late Bill authorising it to raise new preference shares. The money is required to repay borrowings to complete the purchase of the Dudley undertaking, and also to meet the large outlay, estimated at £118,000, necessary on new plant and extensions of cables.

**Foot's Cray: Electric Supply.**—The Foot's Cray Electricity Supply Co. has applied to the Woolwich Borough Council for a supply of electricity in bulk, and terms have been quoted, after investigation by the Woolwich Council's Consulting Engineer, Mr. J. F. C. Snell. Should the arrangement be carried out a capital expenditure of £4,290 will be involved by the Woolwich Council.

**Greeland: Public Lighting.**—A meeting of ratepayers has sanctioned a scheme for street electric lighting proposed by the Yorkshire Electric Power Co. The Company offered to provide the necessary fittings, maintenance, renewals, &c., for forty street lamps at 40s. per lamp per annum, the plant and equipment remaining the property of the Company.

**Hove: Electricity Undertaking.**—A number of proposals for working the electricity undertaking recently acquired by the Corporation from the Hove Electric Lighting Co. have been received, and they have been referred to the Corporation's consulting engineer for report.

**Manchester: Trading Profits and Rates.**—The Finance Committee is to ask the Corporation to agree for another year to continue the existing basis of contributions from profits of the Corporation's trading undertakings in aid of the rates, which include 1 per cent. on the capital expenditure of the electricity undertaking, and 5 per cent. in the case of the tramways undertaking.

MISCELLANEOUS BUSINESS NOTES AND  
TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £66 15s. to £67 5s. (Last week, the same.)

**Change of Address.**—The office address of J. E. & S. Spencer, Tube Merchant (14 Great St. Thomas Apostle, Cannon Street), has been changed to 16 Dowgate Hill, E.C., and the warehouse is now at 33 Dowgate Hill.

**Royal Warrant.**—Escaré & Denelle, Ltd. (129 Wardour Street, W.), have recently been honoured with the Royal Warrant of Appointment as Manufacturers of Electrical Fittings and Bronzes to his Majesty King George V.



## APPOINTMENTS AND PERSONAL NOTES

We announced in our last issue that Mr. H. Richardson, City Electrical Engineer at Dundee, had been appointed Electrical Engineer to the Salford Corporation, at a salary of £1,000 per annum. Although Mr. Richardson wrote accepting the appointment, he subsequently decided, under pressure by the Dundee Electricity Committee, to remain at Dundee. After a discussion in the Council Mr. Richardson has been offered an immediate increase from £650 to £800 per annum, with £50 annual increments until a maximum of £1,000 per annum is reached. Mr. J. A. Robertson, Burgh Electrical Engineer at Greenock, has now been appointed to the Salford post. The original advertisement brought some sixty applications, and the first short list consisted of ten, from whom Mr. Richardson was finally selected. Since Mr. Richardson's withdrawal, the Committee took the nine remaining candidates and added four others, subsequently reducing this number to eight, from which four were selected to appear before the Committee. One, however, withdrew his application, so that only three presented themselves, and from these Mr. Robertson was selected.

The Leeds City Council has decided to appoint a General Purposes Committee to deal with all questions of wages, hours, dismissal, and control of municipal employees, and has appointed Mr. J. B. Hamilton, the Tramways Manager, as executive officer of the Committee, with an increase of £500 in his salary. This Committee is the outcome of the recent strike, the object being to deal with employees in such a manner as to prevent a recurrence.

Mr. George Broadhurst, Assistant Electrical Engineer in the Worthing Electricity Department, has been appointed Clerk of the Works in connection with the erection of the Basingstoke Council's electricity works. The arrangement is that if Mr. Broadhurst's services are satisfactory he will be appointed Resident Engineer at a salary of £170 rising to £200 on the inauguration of the undertaking.

COMPANIES' DIVIDENDS, REPORTS,  
MEETINGS, &c.

**British Westinghouse Co.**—Continued improvement in the business of this company is notified in the report for 1913. The gross profit amounted to £223,103, and after setting aside £44,100 for depreciation on works and plant, placing £6,728 to redemption of 6 per cent. prior lien debenture stock, there is a net profit of £106,493. The sum of £50,000 is placed to general reserve, the 5 per cent. preference dividend absorbs another £50,000, leaving £6,493 to be carried forward. The capital reduction scheme has been sanctioned by the Court, and under this the balance of £66,899 standing to the credit of profit and loss account in December, 1912, has been absorbed. Mr. P. A. Lange has been appointed managing director.

**Clyde Valley Electrical Power Co.**—The accounts for last year show a net profit of £27,678, and, after applying £3,000 for special reserve, and writing off interest paid to shareholders during construction amounting to £15,155, a sum of £9,477 is carried forward. The revenue from sale of current during the year was £8,000 more than in the previous 12 months, but this has been largely counteracted by the increased cost of coal, labour, rates, and taxes.

**County of London Electric Supply Co.**—An issue of 10,000 six per cent. cumulative preference £10 shares are being offered to the existing shareholders at £11 each. An issue of 6,000 £10 ordinary shares are also being offered at £11 10s. each.

**South London Electric Supply Corporation.**—It is stated that arrangements have been completed for the issue of £50,000 six per cent. cumulative preference stock.

**Vickers.**—In order to meet the growing requirements of the business, a further issue of ordinary shares is to be made.

**Electrical Fatality.**—An inquest was held recently on the death of an electrician named A. Thomas, at the East Pool Mine, Cornwall. The deceased was at work putting up a distribution board in the distribution room at the mine, to which he was to attach certain "dead" wires. He appears, however, to have touched a "live" wire overhead accidentally, and received a fatal shock. It was suggested that having finished his work on the dead board, he proceeded to other work, involving "live" wires, without putting on his rubber gloves. A verdict of accidental death was returned.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 380 [VOL. X., No. 15]

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THURSDAY, APRIL 9, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLOE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-209, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE partial strike of wiremen in London continues, but the number of men on strike is not great, and several have gone back to work. (Page 202.)

THE Electric Vehicle Committee has made recommendations to supply authorities regarding tariffs for charging electrical vehicle batteries. They also recommend that the frames of cars being charged be earthed through the charging plug. (Page 202.)

EXPERIMENTS are being made in Parliament Square and Park Lane with a new pattern of enclosed flame arc lamp. (Page 203.)

A PAPER by Mr. W. C. Clinton recently read before the Illuminating Engineering Society discusses the accuracy with which the illumination produced by a lighting installation can be predetermined. (Page 203.)

THE construction of a wireless telegraph calling apparatus is dealt with in our questions and answers columns. (Page 204.)

SEVERAL patterns of voltage regulator for alternating current feeders are described in an illustrated article. (Page 205.)

AT last Thursday's meeting of the Institution of Electrical Engineers, some problems in connection with the arrangement of automatic signals to obtain the greatest possible frequency of train service were discussed in a paper by Mr. H. G. Brown. The year's working of the L.C.C. Tramways has resulted in a deficit of £91,705. (Page 205.)

LAST week the Patent Office published Specifications relating to the sintering of tungsten for incandescent

lamp filaments, by R. B. Walling, of the American General Electric Company; wireless telephony, by W. T. Ditcham and Grindell-Matthews Wireless Telephone Syndicate; and railway signalling by means of incandescent lamps, by Siemens Bros. & Co. (Page 206.)

SOME results of an investigation into the behaviour of high-frequency ammeters are referred to under "Telephony and Telegraphy." (Page 207.)

A NEW cinematograph, in which the film can be stopped at any time, and a new pattern of electric sign are described in our Trade Section, which also refers to a remarkable example of the perfection to which insulation of electrical machinery can be brought. (Page 208.)

A 1,000-kw. battery with booster and switchgear is required at Belfast; a 300-kw. generating set at Tunbridge Wells; cables, meters, &c., are required at Glasgow; mains at West Bromwich; and a new sub-station at Worcester.—Extensions to plant are also contemplated at Middleton (£6,000); Hove (£20,000); and Torquay. (Page 209.)

THE Deal & Walmer Gas Co. has been granted electric lighting powers with an option to the local authorities in question to take them over within twelve months.—The Kidderminster & Stourport Electric Tramway Co. is to pay £100 damages to a local firm for cutting a private electric supply cable.—The South Suburban Gas Co. has, under pressure, withdrawn the electrical clauses from its gas bill.—The Leeds £200,000 extension scheme has been sanctioned by the Corporation. (Page 210.)

THE General Electric Co. is issuing new capital. The issue of new capital by the County of London Electric Supply Co. has been largely oversubscribed.—The Brush Electrical Engineering Co. made a net profit of £20,000 last year. (Page 210.)

**London Electricity Supply.**—Mr. C. H. Merz's report to the L.C.C. which (1) deals with the existing means for the supply of electricity in London; (2) gives an outline of a complete ultimate scheme for Greater London, and indicates what modifications would be required in any such scheme, if it were limited to the County of London; (3) includes a definite recommendation as to the initial steps to be taken in the direction of a complete scheme, bearing in mind the existing conditions and the general financial position, will shortly be on sale. The second reading of the London Electric Supply Bill has again been deferred, this time until Monday, April 20th.

**Golf by Electric Light.**—Last Saturday night a golf match was played at Bushey Hall by electric light with considerable success. The light was provided by four powerful C.A.V. motor-car head-lamps with parabolic reflectors carried by caddies, and each supplied from a battery carried by another caddie. Two of the lamps were used to illuminate the ball and the ground around the player, while the other two were directed down the course, and enabled the flight of the ball to be followed for fully 150 yards. Good scores were made, and there was only one lost ball in the match.

## THE WIREMEN'S STRIKE

THE strike of electrical wiremen in London is causing very little inconvenience, for, as mentioned in our last issue, the amount of wiring work in progress in London at the time was very limited, and only a small proportion of the men at work have come out on strike. By the Union's own admission the number of strikers has diminished. In some cases the masters are paying the men 10½d. an hour now, which is ½d. above the minimum they had already conceded before the strike was declared, and is the minimum already promised from next July onwards. The Union have evidently withdrawn their demand for 11d., and are now apparently going round to the firms who have men on strike, offering to order the men back if the firm will sign the following:—

"We agree to pay electrical wiremen and electrical fitters on and after the first pay day in April, 1914, a minimum rate of 10½d. per hour, and any further advances of wages which may be secured, to work to the 1912 working rules card of the Electrical Trades Union pending a settlement with the London Electrical Masters' Association, to recognise the erection of all electrical conduits as the work of electricians, and will not insist on the inclusion of a disability clause in any new working rules which may be formulated."

Although the London District Secretary of the Electrical Trades Union has informed us that several leading firms have signed this letter, we have not been able to find a single firm of any considerable magnitude which has done so. In order that we might check the accuracy of the statement issued by the Secretary to the Press that 40 or more firms had accepted the men's terms, we asked him last Saturday for a list of these. A list was given us, after considerable pressure on our part, just as we were going to press yesterday, and we selected three of the largest on it (Messrs. Stegmann, Hampton's, and Waring & Gillow), and telephoned to them. All three deny that they have signed the above letter, or any agreement debarring them from employing both Union and non-Union men.

Probably the total number of electrical wiremen in London who were working previous to the declaration of the strike and who are now "out," does not exceed 150, and some of the largest firms are quite unaffected. The Electrical Trades Union have, in fact, done their members no good, and the only result of the strike is the inconveniencing of half-a-dozen firms by delaying the work on some jobs. Some of the men have suffered grave injustice at the hands of the Union. There are cases in which men earning 11d. and even 1s. an hour have given way to pressure and have struck work, while other Union men are working at 10½d. with the sanction of the Union, and working side by side with non-Union men.

Statements have appeared in the daily Press as to the Newspaper Proprietors' Association having granted all the demands of the Electrical Trades Union with regard to electricians employed in newspaper offices. These statements, however, are inaccurate, and we are officially informed that the following are the facts:—The Council of the Association has recommended its members forthwith to increase the minimum rate from 9½d. to 11d., and other rates above this by 1d. per hour. Night-work is to be paid for at the rate of time and a third, but any man at present receiving time and a half is to continue to do so. The number of hours per week for day-work has been agreed at 50, and for night-work at 48. The other matters referred to in these newspaper statements have not yet been considered by the Association.

On Monday the London News Agency circulated a statement to the effect that on Saturday a member of the Electrical Trades Union employed by the Marylebone Borough Council was sent on a job which the men considered "black," refused to do it, and was discharged, with the result that all the rest of the Union electricians, together with a large number of non-union men, ceased work on Monday. On inquiring at the Electricity Department of the Marylebone Borough Council on Tuesday, we were informed that there is no trouble or disaffection among the workmen, and that all the men are at work.

## ELECTRIC VEHICLES

AT the last meeting of the Electric Vehicle Committee on March 20th it was decided to recommend to supply authorities and companies that for "off-peak" charging the maximum price for the supply of electric energy for charging the batteries of electric vehicles should not exceed 1d. per unit at the declared system and pressure. The Committee do not consider it desirable to make any recommendations as to a special peak tariff, but suggest that special encouragement be given for charging vehicle batteries between 11 p.m. and 6 a.m. by offering a lower rate, and they consider that the supply might be remuneratively given between these hours at a price of ¾d. per unit. The Committee recommend that a scale of discounts be arranged to meet the case of large consumers, and they further recommend the giving of an additional discount of 20 per cent. off for energy purchased by a consumer for re-sale, and metered on the latter's own premises. It was also recommended that a minimum charge not exceeding 2s. be made for current supplied for any one charging operation. The Secretary was directed to send a letter to supply authorities and companies embodying these recommendations. As to the standard charging plug, in connection with which the Committee have recommended to the Engineering Standards Committee that the American standard 150-ampere plug be adopted as the standard for this country (as far as the diameter of contacts is concerned), the Committee have reconsidered the matter of earthing, and, in view of the fact that under certain conditions the charging of the battery might be done direct off a high-pressure supply service through a resistance, they thought it was desirable to earth the framework of the chassis through the plug and receptacle by means of a third earthing conductor embodied in the main flexible charging cable. The Committee recommend that arrangements be made for this earthing in all cases. The Technical Subcommittee are busy dealing with details appertaining to the plug, such as terminals, areas of contact, &c. They are also considering the question of size of battery cells and battery trays, charging voltages, &c.

**The Siemens' Smoking Concert.**—The King's Hall of the Holborn Restaurant was crowded to its utmost capacity on Monday evening last, on the occasion of the reunion of the staffs of Siemens Brothers Dynamo Works and Siemens Brothers & Co. and many of their friends, at their annual smoking concert. Mr. Alexander Siemens was in the chair, supported by Mr. C. Koettgen and other directors and officials of the Siemens firms, and at about 50 tables scattered over the large hall members of the staffs dispensed hospitality to the large number of guests who had been invited. We saw many familiar faces of those now or formerly serving under the Siemens flag, and it was a pleasant opportunity to renew old acquaintances, and to make new ones in the ever-widening circle of Siemens Society. Among the visitors one also recognised many well-known men in the electrical industry and profession. An excellent programme of music and humorous entertainment was provided, and the enthusiastic way in which the artists' efforts were received showed that they were well appreciated. The committee are to be congratulated on the success attending their labours, which enabled such a pleasant evening to be spent. The brilliance of the scene was much enhanced by the improved lighting of the hall, which was principally by half-watt lamps in large holophane bowls suspended from the roof.

**The Institution of Electrical Engineers.**—The following is the result of the Ballot for the election of New Members and for Transfer from one Class to another at the Meeting last Thursday:—*Candidates Elected as Members:* R. de Valbreuze, P. D. Michod, A. E. Powell, D. B. Rushmore. *As Associate Members:* F. F. P. Bisacre, E. J. Hamlin, L. Schüller. *As Associates:* W. L. Jenkins. *As Graduates:* G. V. R. Fraser, W. F. Marchinton, G. H. Murphy, A. J. Ramsay, J. H. D. Sheppard, W. G. Stokes. *As Students:* G. McDonald Buchanan, F. W. Eagle, H. S. Housden, E. W. A. Jammouille, V. R. Krohn, J. F. Lee, C. G. Lovegrove, D. R. McWhinnie, D. Mathieson, H. T. Moody, R. B. Paul, F. H. Pernet, H. P. Rhodes, T. McArdle Ryan, E. J. Shuter, E. Slevin, C. B. Thompson, R. Young, Jun. *Candidates Transferred:*—*From Associate Member to Member:* W. Houlst. *From Associate to Member:* H. J. Gridley. *From Student to Associate Member:* J. L. Moffet. *From Student to Graduate:* E. J. Chawner, H. Cross, L. D. Francois, C. E. Glasspool, B. D. Jain, W. I. Monkhouse.

**Crystal Palace School of Engineering.**—The 124th Award of Certificates was held at the school yesterday. Mr. Cyril S. Cobb (chairman of the London County Council) was in the chair.

## STREET LIGHTING IN WESTMINSTER

EXPERIMENTS in street lighting with a new pattern of arc lamp are being made by the Westminster Electric Supply Corporation. The lamp in question, which is of a type supplied by Siemens Bros. Dynamo Works, Ltd., is of the vertical-carbon, non-magazine, double-enclosed-flame type, and has several points of interest. Two of these lamps are installed in Parliament Square, and some are also being tested in Park Lane. The Parliament Square installation is of particular interest in view of the fact that the whole

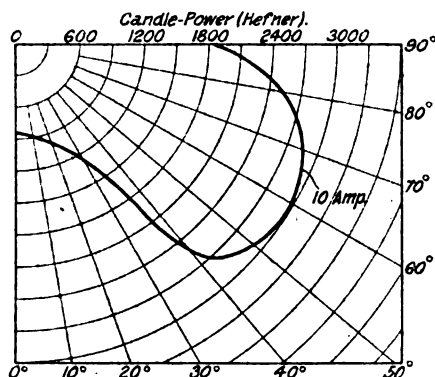


FIG. 1.—POLAR CURVE OF LIGHT DISTRIBUTION.

lighting of that area is about to be reorganised, and the decision as to whether high-pressure gas or electric light is adopted will be largely influenced by the results with these experimental lamps. About forty would be required to light the whole space to replace the existing eighty-five gas lamps, but a vastly improved illumination would result. The lamps are carried on standards 27 ft. above the ground.

The lamps are of the 10-ampere size, and their particularly favourable light distribution is shown in Fig. 1, from which

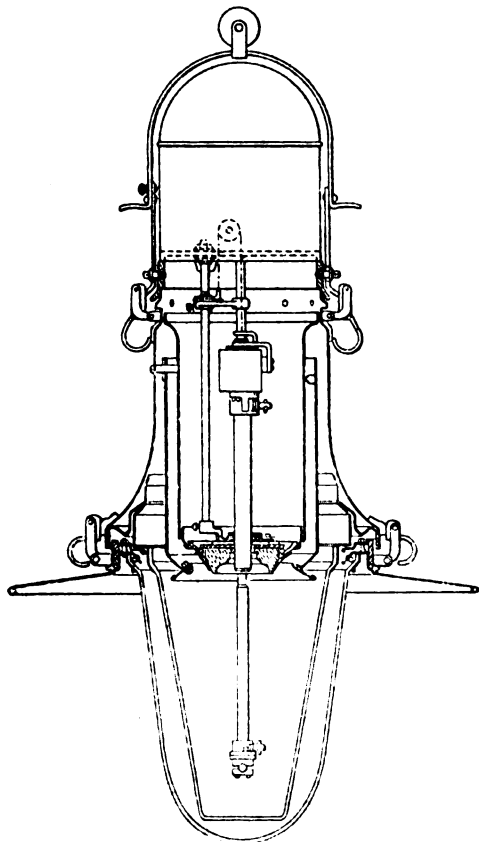


FIG. 2.—SECTION OF LAMP.

it is seen that the maximum candle-power is given about 30° below the horizontal. The pressure across the arc is about 44 volts, and the arc itself is about 1½ in. in length. The colour of the light is pleasing and unvarying, and is a great improvement on the deep yellow characterising some of the earlier enclosed flame lamps. The light is also very steady, and these facts are largely accounted for by the very homogeneous nature of the carbons employed. These are not cored in any way, but have the appropriate chemicals

evenly distributed throughout the carbon. About 100 hours' lighting can be obtained with a single pair of carbons. A cross-section of the lamp is shown in Fig. 2. The feeding mechanism is of the differential pattern, but the main point of interest is in the arrangements adopted for ventilating the lamp so that the fumes from the arc do not cause a deposit on the globe in a position to interfere with the illumination. It will be noticed that above the arc there are three parallel casings, the inner casing containing the mechanism, a removable intermediate casing, and the outer casing. The heated gases from the arc pass between the intermediate and the inner casing, and leave almost all deposit on the inner surface of the intermediate casing, returning to the inner globe between the intermediate and outer casing. The small remaining quantity of deposit collects on the lower part of the inner globe, but the upper part, through which the maximum part of the light comes, remains perfectly clear. The deposit is of a non-corrosive character, and is easily cleaned off from the removable casing and the inner globe. The function of the outer globe is to keep the inner globe from becoming cool, and to protect it from the weather.

In conclusion, we wish to express our thanks to the Engineers of the Westminster Electric Supply Corporation, Ltd., for giving us particulars of these lamps.

## THE PREDETERMINATION OF ILLUMINATION

A PAPER was read on March 17th by Mr. W. C. Clinton, before the Illuminating Engineering Society, entitled, "A Comparison of Estimated and Observed Values of Illumination in Some Lighting Installations." A large number of actual cases are considered, and comparisons are made between the calculated horizontal illumination on the working plane and its value observed by photometry. The point-by-point method of calculation from known polar distribution curves for each source of light gives in general lower values of the horizontal illumination than those observed, the difference diminishing as the effect of walls and ceiling are made less and less either by their colouring or their distance from the lights. Calculations of the flux of light method should give the same mean horizontal illumination as the point-by-point method, although giving no information as to the distribution of the illumination. A third procedure is to calculate from the polar curve the total flux of light liberated in the room, and then to compare the mean horizontal illumination that would be produced if the whole of this flux arrived on the plane of reference with that actually measured, and thus to arrive at a ratio which may be termed the utilisation factor of the installation. A number of cases are gone into in great detail in the Paper, and values of the utilisation factor, varying from 30 to 65 per cent., are obtained, according to circumstances, and the general inference is drawn that the illumination produced in a given room by a given arrangement of lamps can be predicted with greater accuracy than has generally been supposed.

**Congress of Consulting Engineers.**—The second International Congress of Consulting Engineers, promoted by the Fédération Internationale des Ingénieurs-conseils et Ingénieurs-experts, will be held at Berne from July 15th to 22nd this year on the occasion of the Swiss National Exhibition. The last congress of this nature, when the Federation was founded, was at Ghent last year. There are no British representatives on the Committee. Applications for membership must be made to Mr. Herbais de Thun, Secretary of the Congress, 18 rue Marie-Thérèse, Brussels, Belgium. Among the subjects to be considered are general professional rules, propaganda, tariffs of professional fees, conditions of contracts, referee services and arbitrations, and the inclusion of consulting engineers on the juries of exhibitions. Excursions of technical interest will be arranged during the exhibition. It is proposed to hold the next Congress at San Francisco in September, 1915.

**University College.**—The annual report of the work of University College (Gower Street, W.C.) has just been issued. We note that the total number of students during the session 1912-1913 was 2,083. Of these, 128 took courses in engineering. In addition, there were 196 students of other colleges attending the various inter-collegiate courses. The number of graduates was 144, of whom 113 took honours, and 10 gained University scholarships. The scheme of advanced and post-graduate courses in the faculty of engineering has been continued, and those by Professor Fleming on "Telephone and Telegraph Cables and the Transmission of Small Alternating-Current Power" and "Conductors for the Electrical Transmission of Energy," attracted a large number of engineers in practice. Other subjects dealt with included "Steam and Gas Turbines," "Influence Lines and their Application to Structural Design," "Electrical Design," &c.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,386.

With an electric crane brake of Laurence Scott's flapper type, trouble is experienced by wearing of the wooden blocks owing to the load being too light to attract the flapper. The motor is rated at 22 b.h.p. at 600 r.p.m. The crane is designed for 20 tons, but is used for an average load of about three tons. Can any remedy be given for the trouble, which cannot be got rid of by adjustment of the springs.—**POTENTIOMETER.**

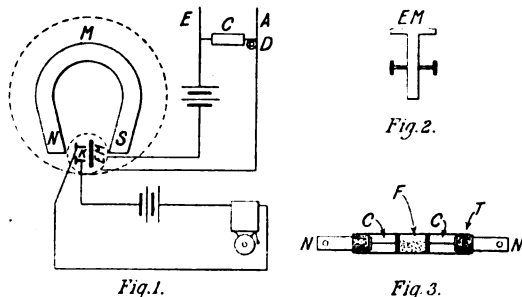
(Replies must be received not later than first post, Thursday, April 16th.)

### ANSWERS TO No. 1,384.

A small wireless installation has been erected, which is working to a receiving station about a quarter of a mile distant; the signals can be heard with the receiver about two inches away from the ear. It is desired to fit up some sort of calling arrangement to enable the receiving station to be called up. This could take the form of a coherer, but, as this cannot be tuned to a given wave, a relay of some description is preferable so that it can take the place of the telephone when not receiving. Please suggest a suitable form of apparatus.—**"CALL."**

The first award (10s.) is given to "ASTATIC" for the following reply:—

An excellent calling arrangement may be constructed at a very small cost in the form of a very sensitive relay and a "home-made" coherer. For a small receiving station



it is practically impossible to better a small coherer of the type indicated in Fig. 3. Figs. 1 and 2 show the circuits and design of a sensitive polarised relay. M is a permanent horseshoe magnet showing N and S poles. EM is an electro-magnet, which is free to move on a pivot, the pivot being just below the half-way point. It will be noticed that the upper portion of the electro-magnet is slightly in the power of the S pole. A pair of contacts, K, are connected to a battery and a single-stroke bell. C is a coherer, D the decoherer. A and E are the aerial and earth wires respectively.

The action is as follows:—A wave is received on the aerial wire which coheres the filings in the coherer. This allows a small current to pass through EM, which makes

the polarity of the upper portion of the electro-magnet a S pole. EM is consequently repelled by S and attracted by N, thus making contact on K, this allowing a current to pass from the battery through the bell, which gives a stroke. This series of operations is continued the whole time that waves are received on the aerial wire, the result being a continuous ringing of the bell. In small installations accuracy in tuning is not necessary, this difficulty being overcome by the coherer shown in Fig. 3. T is a glass tube  $\frac{1}{8}$  in. internal diameter. F are nickel filings which have been silver-plated. N are nickel terminal bars which run through pieces of cork, C, to two small plates, which make contact with the filings when the coherer is cohered. Before using this coherer the two blocks, N, should be pressed together to exclude as much air as possible. They should then be slowly opened to the desired width, according to the atmospheric conditions for receiving. The space containing the filings will then be practically a vacuum. The coherer is then ready for use, and it has been found from extensive experience that it can be adjusted so that the bell will give one ring for a "dot" and two rings for a "dash," that is, of course, if the person transmitting can be relied upon to transmit with the same regularity.

The second award (5s.) is made to "MARP," who writes as follows:—

The object desired may be attained by using an apparatus similar to that shown in Fig. 4. It has been assumed that the receiver at present in use is not of the coherer type, and therefore no decohering arrangement is shown. The two coils, BB, although not absolutely necessary, are

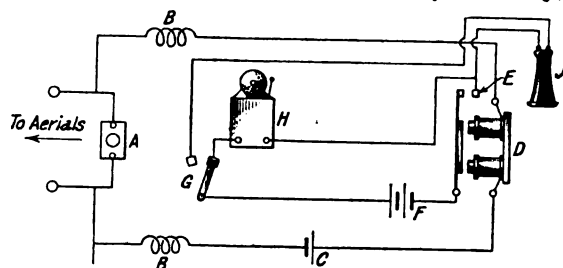


FIG. 4.

- |                       |                                   |
|-----------------------|-----------------------------------|
| A. Detector.          | F. Battery for Bell or Telephone. |
| B. Choking Coils.     | G. Two-way switch.                |
| C. Battery for Relay. | H. Bell.                          |
| D. Relay.             | J. Telephone Receiver.            |
| E. Contact.           |                                   |

highly desirable. They should consist of, say, 120 turns of No. 24 covered wire, wound on a bobbin without a core. Their object is to choke back the oscillatory currents received from the aerials and confine their effect to the detector. The resistance will not be enough to prevent the satisfactory operation of the relay, providing the latter is reasonably sensitive. The apparatus is shown ready to receive a call. When it is desired to use the telephone receiver, the switch, G, must be moved to the left. This puts the call-bell out of circuit. It is advisable to use some form of hook-switch, so that when the telephone receiver is taken off its hook the above operation takes place automatically.

A reply received from "CONDUCTOR" suggests that the relay in the coherer circuit should be fitted with some form of air-brake or dash-pot, so as not to respond to atmospherics or strays, but only to a series of long dashes. He also suggests the use of Brown, Heurtly, or Orling relays with an ordinary oscillation transformer.

**Shipping, Engineering and Machinery Exhibition.**—A considerable proportion of the space at this exhibition, which is to be held at Olympia from September 25th to October 17th next, has already been allotted, and the following will be among the exhibitors:—Adnill Electric Co., Babcock & Wilcox, British Vacuum Cleaner Co., Sherard Cowper Coles, Edison Accumulators, Electric Appliances, Ltd., Feld Bros. & Co., India Rubber, Gutta Percha & Telegraph Works Co., Kelvin, Bottomley and Baird, Marconi's Wireless Telegraph Co., W. McGeoch, Medway Safety Lift Co., Metal Jointing Co., Miralite, Ozonair, Pinchin, Johnson & Co., Worsnop & Co. The Dutch Section will be a special feature of the exhibition.

## FEEDER VOLTAGE REGULATORS

IN modern alternating supply schemes with large generating units there is a growing need for the separate regulation of the voltages of feeders, and several types of regulator which have recently been introduced by the British Thomson-Houston Co., Ltd. (Rugby), are of interest in this connection. These consist in principle of variable ratio transformers with two separate windings connected respectively across and in series with the feeder to be controlled. In one class of regulator the two windings are arranged on separate circular concentric cores, one of which can be partially rotated within the former. The series or secondary winding is arranged in slots on the inside circumference of the stationary core, and the shunt or primary winding in similar slots on the outside circumference of the movable core, and the variation in the feeder voltage produced by the regulator is entirely due to the change in the angular positions of these cores.

The windings on both stationary and movable cores are in effect polar windings. With a given pole of the primary opposite a similar pole of the secondary, the regulator will

like an ordinary transformer, with the primary winding connected across the line and the secondary in series as before, but with a number of tapings brought up to a multiple-point switch, either hand-operated or controlled automatically. Such an automatically-controlled regulator is shown removed from its tank in Fig. 2. In the hand-operated pattern the dial switch is interlocked with a reversing switch, so that the boost can be given in either direction, and a mechanical device gives quick transit from one step

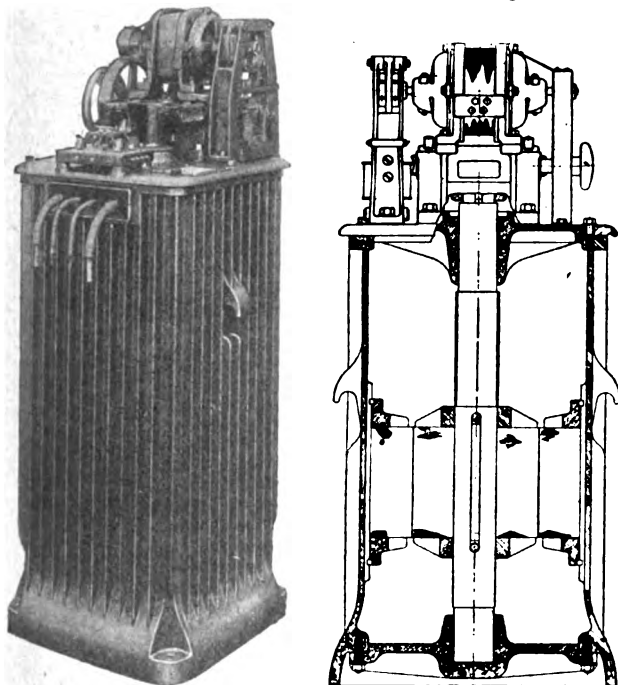


FIG. 1.—SINGLE-PHASE AUTOMATICALLY-CONTROLLED FEEDER VOLTAGE REGULATOR.

boost the line voltage, but will lower it if opposite a dissimilar pole; and the change from "boost" to "lower" is gradual, as a given primary pole is rotated through the angle between a similar and a dissimilar pole of the secondary.

In the single-phase regulator there is a single stationary series winding, but the armature carries a short-circuited winding as well as, and at right-angles to, the shunt winding, which decreases the reactance of the regulator. An exterior view and section of a single-phase regulator is shown in Fig. 1. In the polyphase regulators the excitation is produced by the combined action of shunt windings across the separate phases, and the field is a rotating one, and the variations in line-voltage produced are due to phase displacement. The impedance with the symmetrical winding employed is small and no auxiliary short-circuited coil is necessary. The full-load efficiency varies from 93.5 to 96.5 per cent. in the single-phase regulator, and from 92.5 to 9.65 in the polyphase machines. The cores carrying the windings are usually contained in tanks, with the operating gear on the top. The shifting of the angular position of the movable core can be done by hand through suitable gearing, or by a small electromotor controlled by hand or automatically. Limit switches are provided to open the motor circuit in the extreme position, and a brake to stop the motor quickly as soon as the desired position has been reached. The automatic control is by means of a relay switch actuated by a contact-making voltmeter, and when a compounding effect is desired to compensate for feeder drop, a compensating winding fed by current transformers can be added to the relay switch.

Another type of single-phase regulator has fixed windings

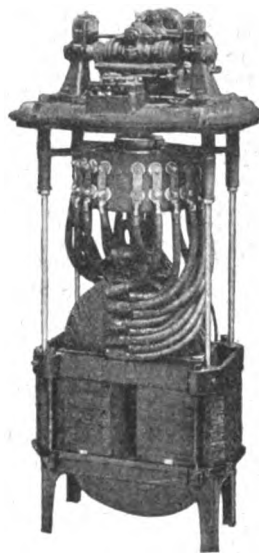


FIG. 2.—SWITCH TYPE REGULATOR.

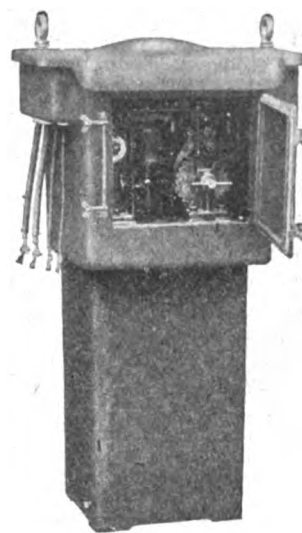


FIG. 3.—SMALL AUTOMATIC INDUCTION REGULATOR.

to another, but in the automatic controllers a second secondary winding renders a reversing switch unnecessary, and an arrangement of multiple-contact fingers and preventive resistances is provided, so that the switch can stop in any position. With this pattern of regulator the efficiency is from 95 to 97 per cent. for hand-operated, and a little less for those automatically controlled. Another type of automatically-controlled regulator for small feeders is shown in Fig. 3. This has a movable core with few slots and considerable angular movement, and is controlled by a step-by-step gear driven by a constantly-running motor through clutches, and controlled by a voltage relay. This style of regulator is made in sizes up to 2.2 k.v.a., and has an efficiency of about 90 per cent. A hand-worked regulator of similar construction is also made.

## ELECTRIC TRACTION NOTES

At last Thursday's meeting of the Institution of Electrical Engineers, Mr. H. G. Brown read a Paper entitled "The Signalling of a Rapid Transit Railway, a Study in the Relation between Signal Locations and Headway." His remarks were devoted entirely to track circuit automatic signalling, which, he said, with a frequent service was cheaper per unit section, as well as permitting of closer headway, than any manual system. He explained the general arrangement of signals and overlap for straight-away working, and discussed the influence of the time of station stops on headway, by ingenious diagrams. He showed how, if trains are run right up to the theoretical limiting headway, any delay of a train above the scheduled station-stop caused greater and cumulative delay due to the effects of acceleration and deceleration. There were, however, two ways by which the effect of station delays could be lessened; one was by additional home signals obtained by sub-dividing the station section, and letting the sections, still of standard length, overlap each other. The effect of different numbers of these was investigated, and a graphic construction was given for determination of the correct points of sub-division. Another method was the "speed control" system, in which a train was allowed to approach nearer than the standard distance behind a standing train, but its previous deceleration was ensured by a series of signals with time-limit appliances arranged to clear a predetermined number of seconds after the entrance of the train into its approach section. Although this system has given satisfaction where it has been tried, Mr. Brown had objections to it as not

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published April 2nd, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications. Names in italics indicate communicators of inventions from abroad.

5,734/13. **Multiple Recorders.** B.T.-H. Co. (*A.E.G.*). Different markings are produced by the use of a paper soaked in an electrolyte and different electrodes, or by different current strengths. One or both sides of the record sheet may be used. It is mentioned that suitable electrolytes are potassium ferrocyanide or iodide, *e.g.*, paper soaked in the first will give a red, blue, or green line with a positive electrode of copper, iron, or steel. Eight figures.

5,926/13. **Three-wire Generator.** F. NEWTON and NEWTON BROS. The machine acts as an auto-transformer, balancer, booster, or three-wire generator. The armature winding span is  $1/3n$  of the periphery, where  $n$  is the number of pairs of poles, also spaced a distance  $1/3n$  apart, in combination with  $3n$  brushes symmetrically spaced. Interpoles are provided. The main poles are compound wound. Four figures.

6,136/13. **Nitrogen Fixation Furnaces.** E. KILBURN SCOTT. A conductor between the electrodes is connected through a condenser to a high-pressure high-frequency supply, so that as the arc is periodically interrupted it is started at once by the discharge breaking down the air between the electrodes. Three figures.

6,369/13. **Telephony.** D. H. KENNEDY and J. W. TURNER. The cord circuits are automatically disconnected by relays controlled by the subscribers' hook switches, so that the lines are cleared, in advance of the withdrawal of the plugs by the operator, as soon as both subscribers have replaced their receivers. About fourteen figures.

12,076/13 and 12,157/13. **Wireless Telephony.** W. T. DITCHAM and GRINDELL-MATTHEWS WIRELESS TELEPHONE SYNDICATE. The first specification describes how microphones may be mounted that, on becoming unduly heated, those in use can be cut out of circuit and others cut in, *e.g.*, they may be mounted on a rotary plate with metal segments. The second specification describes a switching arrangement whereby, on moving a single switch, a circuit is made through a relay which disconnects the aerial from the primary receiving inductance, and connects it in the transmitting circuit. On further movement of the control switch the circuit is energised through another relay. The specifications have three and one figure respectively.

14,795/13. **Sintering Tungsten for Lamp Filaments, &c.** R. B. WALLING (American General Electric Co.). The broad claim is for sintering metal rods by mounting them without lateral confinement, so that the sintering current can be passed throughout their entire length, whereby the whole rod can be raised to a sintering temperature in an inert atmosphere. The cooled contacts at the ends of the rod are arranged so that they automatically approach and exert sufficient pressure on the rod as it contracts. One of the contacts is floated in mercury for this purpose.

17,713/13. **Railway Signalling.** SIEMENS BROS. (*Siemens & Halske A.-G.*). Red and green incandescent lamps are arranged so that when the green lamp is luminous it is in parallel with the red lamp, which is of such a pressure that, with a resistance in circuit, it is not luminous while the other circuit is complete. One figure.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** DOULTON and MORRIS [Insulators] 6,421/13 and 5,501/14; MIRZA [Cables] 6,817/13; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Distributing systems] 13,656/13; SIEMENS-SCHUCKERTWERKE [Rotary presses and paper-calendering machines] 24,017/13.

**Dynamos, Motors, and Transformers:** BRITISH ELEC. TRANSFORMER Co. and CROSBIE-HILL [Transformer arrangements] 6,799/13; CHRISTIE (*Galvanische Metall-Papier Fabrik A.-G.*) [Brushes] 25,465/13.

**Electrometallurgy and Electrochemistry:** SIEMENS BROS. (*Siemens & Halske A.G.*) [Electro-diathermic treatment of the body] 16,985/13; FISCHER [Process for heating articles in furnaces] 17,490/13; FRIEDR. KRUPP A.-G. [Furnace electrode holders] 5,414/14.

**Ignition:** VARLEY, 17,607/13.

**Storage Batteries:** LUCAS [Vents] 17,584/13; SVENSKA AKKUMULATOR AKTIEBOLAGET JUNGNER, 30,082/13; DE SEDNEFF, 1,119/14.

**Switchgear, Fuses and Fittings:** POLLAK [Interrupters] 6,122/13; MILLER and BOOTHMAN [Regulators] 6,371/13; MELLERSH-JACKSON (*Eyquem*) [Regulators] 7,156/13; CANTONO [Automatic starters] 7,241/13; COX [Fuses] 9,144/13; HOLMES and KEMP-WELCH [Overload circuit-breakers] 13,587/13; MITCHELL and COOPER [Multiple way separators] 19,212/13; HENLEY's TELEGR. WORKS and BISHOP [Cable bonding clamp] 20,195/13.

**Telephony and Telegraphy:** MARKS (*Gen. Engng. & Constr. Co.*) [Printing telegraphs] 29,057/12; SIEMENS BROS. and GRINSTEAD [Telephone test-circuits] 7,125/13; SIEMENS & HALSKE A.-G. [Telephony] 10,685/13 and 12,651/13; MORSE [Telephone locking] 18,160/13; MARCHANT [Sound transmitters] 460/14.

**Miscellaneous:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Steering-gear] 1,505/13; LEAVITT [Timing mechanism for torpedoes] 6,272/13; STERN (*Hubert*) [Dry batteries] 6,950/13; GLEASON [Boron copper] 8,790/13; FRIEDRICH [X-ray tubes] 9,449/13; BLACKALL and HUTT [Locking of railway points] 12,599/13; BARTLETT and BRUCE [Compasses] 13,684/13; SIMMS and ROLPH [Indicators for automobiles] 13,732/13; BARKER [Compasses] 14,083/13; GIBSON, FARMER and READ [Indicating approach of trains] 14,384/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos and Motors:** SIEMENS-SCHUCKERTWERKE [Rotors: cooling] 5,828/14.

**Instruments and Meters:** A.E.G. [Watt-hour indicating magnet motor meter] 4,356/14; SIEMENS-SCHUCKERTWERKE, 6,341/14.

**Miscellaneous:** HEINS [Substitution resistances] 10,252/13; WEINTRAUB [Vapour devices] 6,352/14 and 6,353/14; A.E.G. [Condenser with covering of metal bands] 6,418/14.

The following Amended Specifications may now be obtained:—

**Dynamos, Motors, and Transformers:** F. SPINELLI [Static three-phase to single-phase transformation] 2,471/13.

**Miscellaneous:** L. J. ARON, C. WIENER, and X.L. ELEC. Co. [Driving gear for clocks] 19,257/12.

### Appeal from Comptroller's Decision

3,162/13. **Ductile Tungsten Filaments.** WESTINGHOUSE METALLFÄDEN GLÜHLAMPENFABRIK. An appeal has been entered against the Comptroller's decision not to grant this Patent.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

6,701 of April 10th, 1900. **Lithographic Printing Plates.** O. C. STRECKER. By the electrolysis of aqueous salts between soluble electrodes insoluble salts are formed on metal plates.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** E. A. CAROLAN (*G.E. Co., U.S.A.*) [Starting rotary-converter] 27,765/02; R. F. HALL [Lighting by axle-driven dynamo and accumulators] 27,850/02; E. WITZENMANN [Armouring cables] 27,743/08.

**Dynamos, Motors, and Transformers:** B.T.-H. Co. (*A. D. Lunt, U.S.A.*) [Regulation of D.C.-A.C. rotary-converter] 23,589/00.

**Electrochemistry and Electrometallurgy:** D. HELBIG [Furnace for production of oxides of nitrogen from the air] 27,790/07.

**Heating:** O. H. FIDDES and H. A. SEIFKE [Water] 16,496/08.

**Meters:** H. LANDIS and G. K. GYR [Induction] 27,283/08.

**Storage Batteries:** A. O. TATE [A pasted bi-polar plate] 28,106/07, 28,132/07, 10,764/08, 10,767/08, 10,768/08, and 10,769/08.

**Switchgear, Fuses and Fittings:** J. D. HILLIARD [A.C. circuit-breakers with magnets normally short-circuited] 25,941/01; J. F. MARSHALL [Adapter and switch] 27,244/08.

**Telephony and Telegraphy:** J. A. FLEMING and MARCONI Co. [Military wireless sets on motor-vans] 23,163/00.

**Traction:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Series-parallel contactor control system] 27,893/03; P. M. JUSTICE (*A. W. Kiddle and A. M. Baumann, U.S.A.*) [Petrol-electric] 27,236/08.

**Miscellaneous:** G. H. OATWAY [Testing automatic fire-alarms] 23,018/00; J. T. H. DEMPSTER [Starting mercury vapour lamps] 27,637/04; C. P. STEINMETZ [Starting mercury vapour lamps] 27,638/04; W. R. SYKES, C. J. COOKE, and W. R. SYKES [Remote control of lantern slides] 29,001/06; V. G. MIDDLETON [Indication of level of a liquid] 27,898/07.

providing fully for cases where a train entered the section at a lower speed than was intended.

The discussion was opened by Mr. Roger T. Smith (Electrical Engineer, Great Western Railway), who spoke of the possibility of stray currents interfering with direct current track circuits, and preferred the A.C. system. Mr. A. T. Blackall (Chief Signal Engineer, Metropolitan Railway) said that some of the conditions in a surface railway were different from those underground, such as the author had dealt with. In his own railway, a system of automatic signalling was under consideration for open-air work. This would have signals of very distinctive character, to be seen easily in bad weather. They would be of the upper quadrant type, with three positions or "aspects," a horizontal danger position, an upwardly-inclined position indicating only the next section clear, and a vertical section showing that two or more sections were clear. These would be controlled by A.C. track circuits, and ramps would be provided to act as automatic train stops, and also to give an audible signal in the cab. Treadles would probably be provided in addition to the track circuits for the signal control. Mr. H. W. Firth (G.E.Ry.) regretted that more had not been said as to junctions and terminals. He thought that the type of rolling stock had a good deal to do with the length of the station stops. The systems brought forward by the author appeared only possible when trains stopped at all stations, and he suggested that the addition of non-stop trains might therefore really decrease the carrying capacity of the line. Mr. Brown replied at some length, mentioning 44 trains per hour as the rush hour service on the District Railway, where in some places two additional home signals were used, and repeated his objections to the speed control system.

The proposal of the North Eastern Railway Co. to run trolley omnibuses between Gateshead and Newcastle stations is meeting with considerable opposition, both on the part of the Newcastle Corporation and the Gateshead & District Tramways Co.

The London United Tramways Co., after a hard fight before a House of Commons Committee last week, has succeeded in obtaining powers to run trailer cars. As in every proposal of this description, the London police authorities were among the opponents.

In his speech last Tuesday regarding the London County estimates for the forthcoming year, Mr. R. C. Norman, Chairman of the Finance Committee, reviewed the present financial condition of the tramway undertaking, and announced that last year's working had resulted in a deficit which would have to be met by drawing on the reserve fund to the extent of £91,705. This would leave the reserve fund at £187,851. Nothing could therefore be added to the renewals fund, which was now £548,713. The original estimates for the year had showed a balance of income and expenditure. The unsatisfactory result was attributed to motor-omnibus competition. It was hoped that the running of trailer cars, and further lowering of fares, would result in slightly better working this year, but, taking the receipts

at 9d. per car mile, only a little better than last year, there would still be an estimated deficit of £46,682, with no contribution to renewals.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A detailed report of an investigation into the behaviour of high-frequency ammeters by J. H. Dellinger, of the United States Bureau of Standards (Washington), is now available, and is known as Reprint No. 206 (from the Bulletin of the Bureau of Standards, Vol. 10). Some of the conclusions reached are that most of the errors of the commonly used high-frequency ammeters are due to mutual or self-inductances of parts which were supposed negligible. The use of high-resistance metals in the working parts, keeping them of very small cross-section, eliminates errors in most cases. In hot-strip ammeters, if the strip be kept thin enough, the observed errors depend entirely on the current distribution in the terminal blocks, and can be eliminated. An instrument free from theoretical objections consists of current elements arranged equidistantly on a cylindrical surface, and fed from the middle points of the ends of the cylinder; but in practice the fine wires or strip may vary in hardness or in cross-section, and the instrument may read correctly at high frequency, and not at a lower frequency, or *vice versa*. The only reliable instrument over the range of frequencies used in wireless telegraphy is that in which a single hot wire is used; but two wires in parallel immersed in an oil-bath are nearly as reliable, and may be used to measure currents up to 10 amperes. During the tests it was observed that the changes of current distribution in instruments whose working parts were of low-resistivity metal all occurred within the range of radiotelegraphic frequencies (100,000 to 1,500,000).

The Local Government Board has sanctioned the borrowing by the Hull Corporation of the sum of £192,423 for the purchase of the telephone system in Hull. This at last settles the position of the Hull Corporation in regard to its telephone system, which has been the subject of so much controversy for several years past.

The Greek Administration confirms that since January 15th last the international rates to Crete "via Eastern" have been the same as those to Greece.—The Prussian line between Behbahan and Ahvaz was down on the 2nd inst. between Ram and Hormuz, and was restored on the 4th.—Communication with Siam via Moulmein was interrupted via Kanburi between Myitta and Kanburi, and via Raheng between Maesort and Raheng, for a short while. Telegrams for Siam were routed via Madras-Saigon.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 209. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**SEARCHLIGHT PROJECTORS.**—An advance proof of a new pamphlet dealing with searchlight projectors has been sent us by Crompton & Co., Ltd. (Chelmsford). Projectors for general commercial as well as for military use are listed. The sizes range from 12 in. diameter to 42 in. diameter, taking currents from 25 up to 180 amperes. The Company has specialised in this branch for nearly thirty years, and has supplied projectors to the British and foreign Governments, as well as the leading steamship and commercial companies. Among their uses may be mentioned surface mining, stage and advertising, &c. Hand or automatic gear is provided as required.

**TRANSPORTERS, PULLEY-BLOCKS, &c.**—Messrs. S. H. Heywood & Co., Ltd. (Reddish, near Stockport), have issued an extremely attractive list relating to electric transporters, pulley-blocks, and runways. The illustrations are admirably executed, and clearly show the application of the various types of these devices. The illustrations of some patterns of electric pulley-blocks for hanging on the crab of a hand-crane, and small transporters for use on horizontal arm jib-cranes, are particularly interesting.

**MOTOR-CAR ACCESSORIES.**—A new price list issued by the Sterling Telephone & Electric Co., Ltd. (210-212 Tottenham Court-road, W.) deals with the lighting of automobiles by means of battery and dynamo—constant pressure being obtained by armature reaction. Included is a range of head-, tail-, and side-lights, &c., horns, sparking-plugs, pocket and dash-board ammeters and voltmeters, portable lamps, wires, &c. The Company's vibrating relay for charging accumulators is also listed.

**INSULATING COMPOUND.**—A leaflet from Werths & Co. (41 Aldersgate Street, E.C.) describes a new non-rubber compound for insulating and filling in cable ends, sleeves, accumulator boxes, &c. This compound has been tested by the Reichsanstalt up to 60,000 volts, and is impervious to acid and water, as well as being non-shrinking. It becomes as fluid as water when melted. A transparent compound for similar purposes is also made.

**FANS.**—A supplementary price-list issued by Scholey & Co., Ltd. (151 Queen Victoria Street, E.C.), embraces desk, wall, ceiling, and porthole types for both direct- and alternating-current circuits.

**CONDUIT CONTINUITY FITTINGS.**—The "Demon-grip" conduit continuity fittings are priced in a supplementary pamphlet recently issued by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.).



### AN IMPROVED CINEMATOGRAPH

LAST Friday we were afforded facilities to inspect, at the Regent Street Polytechnic, a cinematograph projector patented and manufactured by L. Kamm & Co. (27 Powell Street, Goswell Road, E.C.). By means of a clutch connecting the film and shutter mechanisms, the film can be arrested at any moment, so that the picture in the "gate" at that moment is projected on the screen as a lantern slide. Besides the addition of the clutch, novel features consist in making the shutter in the form of two or more fan blades—the machine which we saw had three—and arranging it between the lamp and the film. When the clutch is thrown out the film is stopped and one picture remains stationary in the gate, but the shutter continues to revolve, and for about half a revolution keeps the light and heat of the lamp from the film, and by the fan action directs an air-blast on the film. It will be seen that the arrangement is particularly suitable for lectures and teaching purposes. The clutch is held off by an electro-magnet which may be energised by the lecturer himself through a push-button switch. In addition, manual control by the operator is possible. As soon as the lecturer desires the film to proceed, he releases the push-button switch, and this can be arranged to ring a bell in the operator's room, so that the operator can reduce the strain on throwing in the clutch by giving the driving mechanism a few turns by hand by means of a handle provided.

### A REMARKABLE INSULATION TEST

AN example of the high pitch of perfection which has been attained in the manufacture of electrical machinery has been brought to our notice by the British Thomson-Houston Co., Ltd. (Rugby). They supplied a motor direct-coupled to a pump on a combined base plate to Messrs. A. & F. Manuelle, of Guernsey, some six months ago. On being unloaded from the ship at Guernsey, the set was deposited on the top of a stack of timber on the Quay, and during a storm the stack collapsed and the machines were precipitated into the sea to a depth at high tide of about 20 ft. It was impossible to recover the set until low water, so that it was subjected to the action of sea-water at a considerable pressure for about half a day. The motor was somewhat damaged by the fall, and in addition to a bent shaft, had one foot broken off and the end-shield at the commutator end cracked through. As the machine appeared to be electrically in good condition with the exception of the wetting, Messrs. Manuelle proceeded to repair the mechanical defects. The cracked end-shield was patched, a wrought-iron foot fitted, and the armature shaft straightened, as far as was practicable, in a lathe. The motor was then reassembled, and the set installed. No dressing of any sort was applied to the windings, and the machine was left to dry itself out in service. In spite of the fact that the shaft is still slightly sprung, the motor has been running satisfactorily ever since it was installed, and although the supply pressure is 420 volts, there is no measurable leakage of current. The British Thomson-Houston Co., Ltd., in insulating the windings of their machines, ensure that every particle of the cotton covering of the conductors is thoroughly impregnated with insulating varnish, and the high quality of the material used is also an important factor in attaining such good results.

**Osram Lamp Patents.**—The recent refusal of the Gabriel Lamp Co. to answer two out of a series of interrogatories put to it by Osram Lamp Works, Ltd., in connection with the pending summons for an injunction to restrain the Gabriel Co. from alleged infringement of Osram patents was before the Appeal Court on Monday and Tuesday last. The Master of the Rolls, Lord Justice Buckley, and Mr. Justice Channell, were unanimous in allowing the interrogatories, thus reversing Mr. Justice Eve's decision in the Chancery Division (ELECTRICAL ENGINEERING, March 5th, p. 139). The interrogatories objected to asked whether certain lamps supplied to the Gabriel Co. were made by the Compagnie Général d'Electricité of Paris, and if not, by whom were they supplied. It was argued by the Gabriel Co. that the identity of the manufacturer was only of assistance to Osram Lamp Works as a step to identifying the process used in the lamp manufacture, and that therefore the question was not a strictly relevant fact, and should be disallowed. It was further contended that the relevant issue was not how were the lamps made, but were they made according to the claims of a certain patent specification.

It is announced that Osram Lamp Works, Ltd., has issued a writ for alleged infringement of Patents Nos. 23,899/04 and 18,622/06 against Scholey & Co., Ltd., by the sale of Britannia Lamps.

## LATTICE ARMOURING

to "make good"

must be strong, flexible, elastic, rust-resisting, durable and of the pattern best adapted to the special requirements of any particular job.

## "PRANA" LATTICE ARMOURING

fulfils all these requirements and is also of excellent appearance and

VERY MODERATE IN PRICE.

♣ Made in a great variety of patterns in steel and brass wire, flat lattice pattern, &c., &c.

♣ Specially designed for covering Flex.

♣ Insulates against heat—protects from fire. Indispensable for Chandeliers, Irons, &c., &c.

♣ Send for descriptive illustrated Price List.

## AERATORS LIMITED

(Dept. E k.) Upper Edmonton, London, N.

### ELECTRIC SIGNS



WE illustrate here an unusual application of the electrically-illuminated sign which has been made by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.). Two of this type of sign are usually supplied, one for each side of the door, and they are curved to take the door jamb corner. Illuminated name-plates of this description are comparatively a novelty, and are very effective as an advertising device, being equally visible by day or night. The difficulty generally presented by this class of sign is to secure adequate and even illumination; taking into account the very small space allowed between the front of the sign and the wall itself. As a general rule, lamps in fairly large numbers are used in order to get satisfactory results. In this particular instance sixteen 2½-c.p. lamps

were employed, which gives very even illumination.

**Visit to the Ediswan Works.**—The Ponders End, Middlesex, Works of the Edison & Swan United Electric Light Co., Ltd., were visited on Thursday last by the Association of Engineers-in-Charge. The lamp department was seen in the following order:—Glass making, bulb blowing, tube drawing, manufacture of carbon filaments, flashing filaments, preparing and mounting metal filaments, jointing filaments, stem making, sealing-in filaments, exhaustion of lamps, capping, stamping and testing of the finished lamp. Demonstrations and regular work were carried on during the tour, and explanations were given of the various processes by the most experienced members of the staff. In the engineering department the visitors were shown the complete manufacture of holders, switches, plugs, and other electrical accessories, and in the large turret shops a great variety of automatically turned brass and iron work. The manufacture and assembly of large switches, high-tension switch-gear, and other electrical goods were seen in the large brass shop. Electric fans and heating apparatus, including all forms of Bastian radiators, were shown during their entire manufacture. Passing on to the foundry, the process of iron and brass casting was demonstrated, and the remainder of the tour included the subsidiary processes of stamping, nickel and silver plating, slate enamelling, lacquering, &c. Tea was served in the general offices, during which the Chairman of the Association's Education Committee expressed a vote of thanks for the cordial reception of the visitors and of the visit's educational value. Mr. E. Gimmingham briefly replied on behalf of the directors and staff.

**The Strength of Metal Filament Lamps.**—The General Electric Co., Ltd., call our attention to a note in a contemporary to the effect that an electric hand lamp which dropped down the shaft of a colliery 760 ft. deep was smashed as far as the case and the accumulator were concerned, but that the Osram bulb was found to be intact, and was, in fact, used straight away in conjunction with another accumulator.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Barwell.**—A Board of Trade inquiry was held last week at Hinckley concerning an application by the Midland Electric Light & Power Co. for a provisional order for supplying in Barwell and Earl Shilton.

**Belfast.**—Mr. T. W. Bloxam, the City Electrical Engineer, recommends the installation of a 1,000-kw. battery, with boosters and switchgear, at an estimated cost of £10,800. This is a temporary expedient to carry the department over the period before the erection of the first section of the new power station, the only other alternative being to refuse applications for supply or to curtail the tramway service. Both of these, however, the Tramways and Electricity Committee regard as out of the question, and recommends the Council to adopt the above proposal.

**Glasgow.**—Twelve months' supply of cables, meters, and arc-lamp carbons. City Electrical Engineer. April 27th.

**Howe.**—The Consulting Engineers, Messrs. Handcock & Dykes, contemplate an expenditure of £20,000 upon the electricity undertaking.

**Leeds.**—One 12,000-kw. turbo-alternator with surface condensing plant. Electrical Engineer. May 11th. (See an advertisement on another page.)

**London: St. Pancras.**—The Finance Committee of the L.C.C. recommends the sanction to the following loans:—Mains, £7,055; machinery, £1,292; house services, £1,040; meters, £125.

**Middleton.**—Extensions at an estimated cost of £6,000 are contemplated.

**Nottingham.**—Twelve months' supply of cables, mains accessories, and electrical sundries. City Electrical Engineer. April 16th.

**Torquay.**—Two water-tube boilers, fuel economiser, steam pipes, &c. Borough Electrical Engineer. April 20th.

**Tunbridge Wells.**—One 300-kw. steam prime mover with alternator and exciter. Borough Electrical Engineer. April 22nd.

**West Bromwich.**—Mains extensions at an estimated cost of £1,450 are to be carried out.

**Worcester.**—An expenditure of £500 is contemplated upon a new sub-station.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Blackburn.**—Swimming bath. Architect, J. Hayhurst, 82 Richmond Terrace.

**Blackpool.**—Rebuilding, (after fire) printing works of H. Maxwell & Co.

**Bury (Lancs.).**—Cinematograph theatre. A. E. Millward, 9 Knowsley Street.

**Croydon.**—Fourteen houses, Sefton Road. P. Richardson, 80 Addiscombe Avenue.—Twelve houses, Ashburton Avenue, and sixteen houses, Compton Road. T. G. Crump, 5 Station Road.—Twelve houses, Teevan Road. Higgins & Thelmersen.

**Hastings.**—East Sussex Hospital (£50,000).

**Prestwich.**—Alterations to County Asylum.

**Wallasey.**—Cinematograph theatre, Victoria Road, Seacombe. W. J. Embank.

**Willesden.**—New school. Middlesex Education Committee.

## TENDERS RECEIVED AND ACCEPTED

**Blackburn.**—A contract has been placed with the Electric Construction Co. for a twelve months' supply of motors. The same Company has received an order for a three-wire booster.

**Blackpool.**—A contract has been placed with the United Electric Car Co. for six toast-rack cars.

**Bristol.**—The Electrical Engineering & Equipment Co., Ltd., has been awarded the contract for the complete electrical equipment of the forthcoming international exhibition, including mains, arc, incandescent, and "strip" lighting, main and distribution switchgear, and centrifugal pumps and motors for the cascades.

**Leeds.**—The contract for the reconstruction of certain portions of the tramway track has been placed with Messrs. D. Speight & Sons.

**London: Battersea.**—The following tenders have been accepted for twelve months' supplies:—Consumers' fuse-boxes, British Insulated & Helsby Cables; electrolytic meters, Reason Manufacturing Co.; troughing, bridges, bitumen, &c., Callender's Cable & Construction Co.; carbon-filament lamps, British Thomson-Houston Co.; box compound, Dussek Bitumen Co.

**Hammersmith.**—A tender by Messrs. Ferranti for six 10-kw. open-type transformers at £12 each has been accepted. These transformers are to be placed in switch pillars in connection with street lighting, experiments with them having shown that considerable improvement has been effected in the reduction of the loss of energy in the mains, and in the general lighting.

**L.C.C.**—The Asylums Committee has placed a contract with Siemens Bros. Dynamo Works for Tantalum and Wotan lamps.

**L. & N.W. Railway.**—Messrs. Balcke & Co. has received an order for eight natural-draught chimney-type cooling towers having a capacity of 2,000,000 gallons of water per annum for the new power station at Stonebridge Park. This, we are told, is the largest cooling-tower contract ever placed in this country.

**Manchester.**—The following, among other tenders for supplies, have been accepted by the Tramways Committee:—Motor and controller spare parts, British Thomson-Houston Co., Dick, Kerr & Co., British Westinghouse Co.; drawn-wire filament traction lamps, Drake & Gorham; incandescent lamps, switches, bells, telephones, and testing instruments, General Electric Co.; tantalum lamps, Siemens Bros. Dynamo Works; impregnating insulation varnish, Pinchin, Johnson & Co.; carbon brushes for motors, Morgan Crucible Co.; arc-lamp carbons, Baxendale & Co.

The Electricity Committee has accepted tenders for cable by the British Insulated & Helsby Cables, Electrical Engineering & Equipment Co., Johnson & Phillips, and the Western Electric Co.

The General Electric Co. has received an order for 12-ampere "Angold" magazine lamps for the lighting of Oxford Street and Peter Street.

**Middlesbrough.**—A contract has been placed with Siemens Bros. Dynamo Works for a twelve months' supply of Tantalum, Wotan, and carbon lamps.

**Southampton.**—Messrs. Siemens Bros. Dynamo Works have received a contract from the Southampton Harbour Board for a twelve months' supply of Wotan, Tantalum, and carbon lamps, and also for glassware.

**York.**—A contract has been placed with the General Electric Co. for a twelve months' supply of Osram lamps.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £67 15s. to £68. (Last week, £66 15s. to £67 5s.)

**Conduit.**—Gillespie & Beales (Amberley House, Norfolk Street, Strand, London, W.C.), whose "G. & B." cables are so well known, have recently placed upon the market a line of conduit which is of unusually heavy quality and good finish. This conduit will be known as "G. & B." conduit, and prompt delivery can be given of all the usual sizes of close joint, welded, and solid drawn, with a full range of corresponding fittings.

**Liquidations.**—A meeting of creditors of the Electromobile Co. will be held on April 16th, at 12 noon, at the Connaught Rooms, Great Queen Street, W.C.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London,

## LOCAL NOTES

### **Birmingham:** *Electrical Contractors and Municipal Trading.*

—The Birmingham branch of the Electrical Contractors' Association held its Annual Dinner last week, and the occasion was taken to enter an emphatic protest against the present-day extension of municipal trading. Fortunately for the contractors, Birmingham is one of those cities which has wiring powers but has never exercised them, the reason given by Mr. H. Foulds, Secretary of the Birmingham Corporation Electricity Department, being that the electrical contractors in that city are so enterprising that there has been no necessity for the Supply Department to come in.

**Deal and Walmer:** *Electric Supply.*—The Bill of the Deal and Walmer Gas Co., which seeks powers to supply electricity in Deal and Walmer, has been before a House of Commons Committee. Both the Deal and Walmer local authorities are opposing, as well as the South-East Kent Electric Power Co., which already possesses powers to supply in detail in the district, and has erected a power station at the Tilmanstone Colliery in the Kent coalfields, five miles away. The Sandwich, Deal, and Walmer Electricity Supply Co. has also an electric lighting order for this area, but similarly to the Power Co. nothing has been done to give a supply in the district. The proposal of the Gas Co. now is to acquire the order of the Sandwich, Deal, and Walmer Electricity Supply Co. for a sum of £1,100, and to place itself under compulsion to supply within two years. The usual arguments are being placed before the Committee as to the greater facilities which gas companies have in small towns for dealing with electricity supply, and Ascot, Farnham, and one or two other places are being instanced as successful undertakings of this character. A number of London electrical and financial firms have inspected the area, but although they report that, as a commercial proposition, an undertaking would pay, it was not considered sufficiently large enough to be taken up by them. Mr. W. H. Patchell gave evidence in favour of the electricity proposal and estimated an immediate expenditure of £13,000 and an ultimate expenditure of £34,000, and on Tuesday the Committee gave the Gas Co. the electricity powers for Deal and Walmer. Clauses are to be inserted, however, giving the respective local authorities the right to purchase the electricity powers within twelve months. The Chairman remarked, incidentally, that he did not believe the Councils really intended to take up the matter of electric supply.

**Derby:** *Electrical Contractors' Association.*—In Derby, as in Birmingham, the relations between the Corporation Electricity Supply Department and the contractors are of a cordial character. At the first Annual Dinner of the Derby branch of the Association last week, Mr. T. P. Wilmshurst, the Borough Electrical Engineer was a guest, and responding to one of the toasts, wished the branch every success.

**Dublin:** *Electricity Accounts.*—The Finance Committee of the Corporation, in reporting increases in rates for the ensuing year, points out that the electricity receipts for the next twelve months are estimated to be considerably less in consequence of increased expenditure due to labour troubles delaying the delivery of the new plant. An increase in expenditure of some £3,000 is estimated during the forthcoming year.

**Erith:** *Gas Co. and Electric Supply.*—The South Suburban Gas Co. in its Bill now before Parliament, originally included powers to generate electricity for its own purposes and to dispose of any surplus available. No area was scheduled, and, not unnaturally, there was considerable opposition to it by the local authorities concerned. We now understand that the Company has withdrawn all the provisions in the Bill relating to electric lighting.

**Foot's Cray:** *Electric Supply.*—On page 200 of our issue for April 2nd we referred to an application by the Foot's Cray Electricity Supply Co. to the Woolwich Borough Council for terms for a bulk supply. An offer has also been made by the West Kent Electric Co., but the Bexley Council's Electrical Engineer recommends that a supply be given from the Bexley Council's Works at £3 5s. per kw. per annum plus 0'33d. per unit, provided a coal clause is in the agreement.

**Kidderminster:** *Dispute about an Electric Cable.*—An interesting case has been occupying a King's Bench Judge in London during the past week, in which the Kidderminster & Smethport Electric Tramway Co. claims damages against

a local firm of carpet manufacturers who had tunnelled underneath the Company's tramway track in order to lay a cable from one of its works to the other, which is on the other side of the road. The dispute between the two parties has evidently been a matter of considerable local interest, if not amusement, for when the Tramway Co. found, as they alleged, that their tramway track was inclined to subside at the spot in question, men were sent down to strengthen the foundations of the track, and incidentally, and, according to the evidence, accidentally, cut the Carpet Co.'s cable. A second cable was then laid—hence this action, in which the Carpet Co. is counter-claiming for damages in respect of the damage to the first cable. In his judgment, Mr. Justice Rowlatt took a very severe view of the Tramway Co.'s attitude in the matter, which he said was intended to intimidate the Carpet Co. in order that the latter should take a supply of current from the Tramway Co., which also supplied for lighting purposes. He therefore gave judgment for the Carpet Co. in the action, and also on the counter-claim, granting £100 damages and costs in respect of the cut cable.

**Leeds:** *The New Power Scheme.*—The new power scheme involving an expenditure of £200,000 referred to in our "Tenders Invited" columns last week has now been sanctioned by the Corporation. There was, however, some opposition to passing the resolution on the ground that more time should be allowed members to consider one of the most important proposals ever put before the City Council.

**Lurgan:** *Electric Lighting.*—A Local Government Board inquiry concerning an expenditure of £12,000 for the municipal electric lighting scheme was held last week. We referred to the proposal on page 183 of our issue for March 26th.

## APPOINTMENTS AND PERSONAL NOTES

Mr. F. Heppenstall has resigned the position of Manager of the Switchgear and Transformer Department of Johnson & Phillips, Ltd. (Charlton, S.E.), to take up an appointment with the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), where he will devote his attention to matters in connection with wires and cables.

The Highways Committee of the L.C.C. recommends the appointment of Sir Alexander Kennedy as Consulting Engineer in connection with engineering matters concerning the Council's generating station and tramways undertaking, at a retaining fee of £500 per annum, with a commission of 5 per cent. on all plant up to £50,000 per annum, and 4 per cent. on expenditure over this amount. The commission on the construction work connected with the second stage of the extensions at Greenwich, for which the specifications have already been prepared, is to be 3 per cent.

Mr. W. Fennell, Borough Electrical Engineer at Wednesbury, has resigned. The Lighting Committee recommends Mr. John Smith, the Assistant Engineer, to succeed him.

It is recommended that the salary of Mr. F. V. L. Mathias, Chief Electrical Engineer and Tramways Manager to the Warrington Corporation, be increased to £450 per annum.

A working engineer-in-charge is required for the heating and electric generating plant at the Northampton Polytechnic. Wages, £2 10s. per week of 54 hours. The Principal.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**County of London Electric Supply Co.**—The issue of new capital referred to in our last issue was largely oversubscribed. This fact the company regard as particularly significant in view of the prominent part it has played in the London Electric Supply Scheme. The second reading of the Company's Bill dealing with the matter has been deferred until Monday, April 20th.

**General Electric Co.**—Subscription lists closed on Tuesday for an issue at par of 30,000 six per cent. £10 cumulative preference shares, and 10,000 ordinary shares of similar value.

**British Westinghouse Co.**—The report and accounts given in our last issue were passed at the annual meeting on Tuesday. Mr. J. Annan Bryce referred to the contract with the London & South Western Railway Co., and also to the fact that the orders during the three months of the present year have not shown any appreciable falling off.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 381 [VOL. X., No. 16]  
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THURSDAY, APRIL 16, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

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*Other Advertisement Rates on Application.*

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THREE candidates, Messrs. John Christie, Frank Ayton, and R. J. Wallis-Jones, have been put forward as candidates for the Council of the Institution of Electrical Engineers, in addition to those nominated by the Council itself. (Page 212.)

THE position with regard to the wiremen's strike in London is practically the same as it was last week. (Page 212.)

MESSRS. MERZ & McLELLAN's report to the L.C.C. on "London Electricity Supply" was issued yesterday. It recommends the gradual replacement of the existing stations by new stations on sites lower down the river, and also the supplementing and gradual replacement of the distribution networks by new three-phase networks, and the establishment of a new undertaking for the purpose of gradually concentrating production, standardising distribution, and amalgamating all the existing undertakings so far as is possible without compulsory powers or competition.—The Bill promoted by the County of London Electric Supply Co. in conjunction with certain banking firms, has been dropped. (Page 213.)

SOME results of tests of a Kapp vibrator, which is a form of phase advancer are published. (Page 214.)

THE differences in the behaviour of the motor of an electrically-driven boat when tested by running with the boat moored and when under way are discussed in our Questions and Answers columns. (Page 215.)

A PATENT specification relating to electrically-driven ships' steering-gear by the British Thomson-Houston

Co. was among those published last Thursday. Among the others was one by the British Electric Transformer Co. and R. Crosbie-Hill for an arrangement of auxiliary transformers with the main one to keep any damage due to pressure rises limited to a defined area and to provide for pressure regulation without tappings.—Another specification, by Siemens-Schuckertwerke Ges., deals with the driving of rotary printing presses and paper calendaring machines.—A patent by F. R. Simms and R. Bosch, embracing the rotating armature ignition magneto expires during the current week after a full life. (Page 216.)

THE Annual Patents Report for 1913 is reviewed (Page 217.)

THERE has been a conference between the Switchgear Committee of the B.E.A.M.A. and Mr. G. S. Ram, H.M. Electrical Inspector of Factories, regarding the interpretation of some of the Home Office Regulations. Mr. Ram's replies will be added to his memorandum on the Regulations. (Page 217.)

BOARD OF TRADE reports into two recent tramcar accidents on curves find that they were both due to excessive speed. (Page 217.)

SOME statistics relating to the number of telephones in Canada are given.—The American Marconi Co. is not paying any dividend.—An automatic recorder of wireless signals, invented by MM. Ducretet and Roger, records signals from the Eiffel Tower at a distance of 500 km. (Page 218.)

A WEAVING shed lighting installation in which the dynamo is driven by the main engine is described in our Trade Section, which also contains articles on underground station lighting and a large cable contract, and illustrated descriptions of new holders for half-watt lamps, and electric griddle plates. (Pages 218 to 220.)

A 5,000 kw. turbo-alternator set is required at Manchester; generating plant also at Blackrock, Burton-on-Trent, Malvern, and Torquay.—Street lighting schemes are under consideration at Bacup and Malton (Yorks.).—Two railless traction routes are to be constructed at Mexborough. (Page 221.)

MR. J. F. C. SNELL reports favourably upon the management of the Dartford electricity undertaking.—Messrs. Handcock & Dykes have reported upon the Redditch undertaking, and recommend new plant being installed.—The Marylebone Council is offering electric irons, toasters, and kettles on favourable hire-purchase terms.—The central suspended system of street lighting is being abandoned in Accrington.—The Wednesday Council is abandoning "free" wiring. (Page 222.)

BABCOCK & WILCOX pay a dividend of 9 per cent. for the half year. The net profits amounted to £446,073.—The General Electric Company's new issue of capital was considerably oversubscribed. (Page 222.)



## ARRANGEMENTS FOR THE WEEK

SATURDAY, APRIL 18TH.

*Birmingham and District Electric Club.*

7 p.m. At Swan Hotel, Birmingham. "Some Remarks on the Use of Chain Gearing," by H. T. Hildage.

MONDAY, APRIL 20TH.

*Institution of Post Office Electrical Engineers.*

5 p.m. Annual General Meeting at Institution of Electrical Engineers, Victoria Embankment.

TUESDAY, APRIL 21ST.

*Institution of Railway Signal Engineers.*

2 p.m. At Midland Grand Hotel, St. Pancras. "Characteristics and Efficiency Factors of Some Typical Electric Signalling Circuits," by G. H. Crook.

*Institution of Electrical Engineers: Scottish Section.*

8 p.m. Annual General Meeting, at 207 Bath Street, Glasgow. "Current-limiting Reactances on Large Power Systems," by K. M. Faye-Hansen and J. S. Peck.

WEDNESDAY, APRIL 22ND.

*The 25 Club.*

7.15 for 7.30 p.m. Dinner at Connaught Rooms, Great Queen Street, W.C.

*Association of Mining Electrical Engineers.*

7.30 p.m. West of Scotland Branch. Annual General Meeting at Royal Technical College, Glasgow.

*Faraday Society.*

8 p.m. At Institution of Electrical Engineers. Among the Papers down for reading is "Recording Pyrometers," by C. R. Darling.

THURSDAY, APRIL 23RD.

*Institution of Electrical Engineers.*

8 p.m. "Electrification of Railways as Affected by Traffic Considerations," by H. W. Firth.

**U.S. Central Station Statistics.**—From the quinquennial report on the central station of the United States issued by the Bureau of the Census, we note that the number of public supply undertakings increased from 2,805 in 1902 to 3,659 in 1912, or by 30 per cent. Municipal undertakings increased from 815 to 1,562, or by 92 per cent. The total income increased by 252 per cent., and the total expenses by 244 per cent. The increase in the number of employees was 162 per cent. The total output increased from 2,507 million units in 1902 to 11,503 million units in 1912, an increase of 359 per cent. Arc lamps in use increased by 31 per cent., and incandescent and other types by about 320 per cent. The h.p. rating of stationary motors connected was 438,006 in 1902, and 4,130,619 in 1912, being an increase of 843 per cent.

## THE INSTITUTION COUNCIL ELECTION

THREE candidates for the Council of the Institution of Electrical Engineers are being put forward in addition to those nominated by the Council, a list of whom was published in our issue of April 2nd.

Mr. John Christie (Borough Electrical Engineer, Brighton) and Mr. Frank Ayton (Borough Electrical Engineer, Ipswich) have been nominated by several of the leading municipal engineers, who feel that the provincial representation on the Council should be wider, and that the South and East of England should not be without representatives.

The third candidate is Mr. Reginald J. Wallis-Jones, the well-known and popular consulting electrical engineer. He has been nominated and supported by the following gentlemen:—

Sir David Salomons, E. Garcke, G. W. Spencer Hawes, C. W. S. Crawley, F. H. Nalder, Theodore Stevens, J. H. May, Frederick W. Purse, F. W. Smith-Cleburne, Theodore Schonthell, E. Cooper Wallis, L. B. Atkinson, F. B. O. Hawes, A. L. C. Fell, Albert Gay, John Christie, F. H. Nalder, H. M. Leaf, William White, Douglas Knight, Justus Eck, E. J. Fox, Prof. J. T. Morris, N. W. Prangnell, P. A. Lundberg, H. W. Miller, Albion T. Snell, A. Schneider, H. H. Berry, Sydney Dobson, John Bradwell, F. J. Downe, Reginald Belfield, W. B. Esson, Arthur Bergthell, and E. E. Hoadley.

**The Wiremen's Strike.**—The condition of affairs in connection with the wiremen's strike in London is practically as it was last week, but there are signs of the men giving way. The masters show no inclination of acceding to the men's demand that the so-called "disability" clause should be expunged from the working rules, and as in any case there is much less wiring work to be done in London than usual at this time of the year, no great inconvenience is being caused by the strikers being still out of work. There was a case of a "sympathetic strike" of transport workers on one of the outgoing liners being threatened, owing to non-union electricians being employed on overhauling work, but this latter was just being finished when the pickets came up, and in consequence the electricians were able to leave, and there was no trouble.

## The London Electrical Engineers.

Headquarters (46 Regency Street, S.W.) open Sat. till noon.

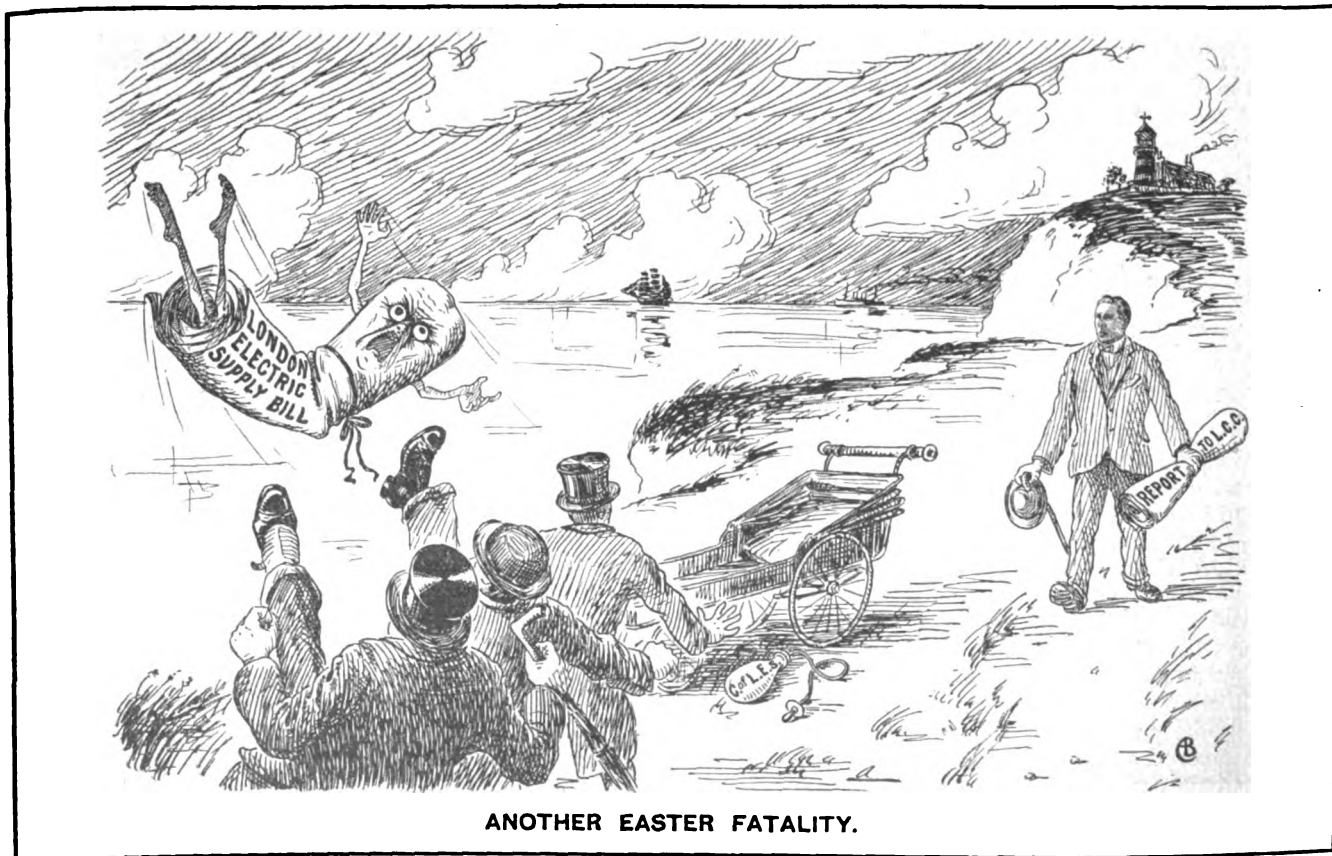
**Rating Exam.** for all Cos. from 7 to 10 p.m. every Wednesday.

(To-day) THURSDAY, APRIL 16TH, C. Co. FRIDAY, APRIL 17TH,

D. Co. MONDAY, APRIL 20TH, A. Co. TUESDAY, APRIL 21ST,

B. Co., Tech. Inst., 7 to 10 p.m. Min. Range, 7 to 9 p.m.

WEDNESDAY, APRIL 22ND.—Recruit Instruction, 7 to 10 p.m.



ANOTHER EASTER FATILITY.

## THE LONDON ELECTRICITY SUPPLY SCHEME

## Messrs. Merz and McLellan's Report.

## The Bill Withdrawn

MESSRS. MERZ & McLELLAN'S report to the London County Council on "London Electricity Supply" was issued at 11.30 yesterday morning.

Considering first the question of generation, it is pointed out that there are practically only two ways of effecting important economies: (1) The extension of eight or ten of the best existing stations, and the gradual abandonment of all the others; or (2) to aim at the gradual abolition of all the stations in or near the Metropolitan area, and to concentrate the production of electricity for all purposes on sites well outside. In considering these two alternatives, Messrs. Merz & McLellan have calculated the cost of production, assuming that ten stations of the most recent type were erected approximately on existing sites, and have compared this with the cost with an equivalent plant lower down the river, plus the cost of transmission to London. On the question of concentration they point out that the general rule which should guide this is that it is economical to continue concentration so long as it is possible to do so by increasing the size and not the number of the individual generating sets. In any case, the sites must be on the river, but the disadvantages of placing them near the load are, the difficulty of storing coal on most of the existing sites, or handling it in the best way, the extra cost of coal "above bridge," the impossibility of by-product developments, and the hygienic and other disadvantages of large fuel consumption near London. Further, the cost of transmission mainly consists of capital charges, and the cost per unit will decrease as the load-factor improves, while the cost of coal remains the same. Consequently, as time goes on any advantages which there might be in having the stations nearer the load will diminish. The establishment of stations at the coal-fields is not recommended for various reasons, the chief one of which is that except for that portion of the load with a very high load-factor, any possible saving in the cost of handling the coal would be more than counterbalanced by the increased cost of transmitting electricity. Messrs. Merz & McLellan consider, however, that it is possible that it may prove profitable at a later date, when extensions are required, to supply the high load-factor portion of the load from sites situated further from London than now proposed.

In recommending the erection of ten entirely new stations lower down the river instead of utilising the existing ones, Messrs. Merz & McLellan say that if all the existing stations were in the hands of one authority, it would pay to shut them down, sell most of the plant, and generate all the electricity at new sites down the river. The saving in working costs in the central area would, they say, be not less than 18 per cent., or about £170,000 a year, after allowing for all capital charges, and this, in conjunction with the present sinking funds, would enable the existing generating plant to be written off by 1931. The initial capital outlay for this purpose, allowing for growth in demand during the next four years, would be between six and seven million pounds. On the other hand, to supply the general domestic demand from ten model stations on any of the present sites would cost at least 20 per cent. more than from plant concentrated on sites down the river, and if the comparison were made with ten of the best existing stations, rearranged and utilised to best advantage, the extra cost would be still greater.

On the question of distribution, Messrs. Merz & McLellan recommend that the present systems, instead of being generally extended, should be supplemented, as required, by a high-pressure three-phase 50-cycle system. This, they say, would cost £3,000,000 less than the extension of the existing D.C. networks which would otherwise be necessary to meet the general domestic demand, and its adoption would reduce the total operating expenses by 12 per cent. In this connection a standard primary voltage should be at once adopted for all new high-pressure mains. For the D.C. distribution network they recommend a 500-volt three-wire system consisting of the existing networks with such slight additions and alterations as might be necessary, but this should not be extended, but should be supplemented by a new three-phase network.

On the control of the distribution, as distinct from the generation and transmission, the report does not give quite definite recommendations. The suggestions tend, however, towards the idea of the existing networks in some cases being retained by the present owners, and the sale of electricity

to all retail consumers being retained by the local distributors whether they own the network or not.

As the most satisfactory and economical method of achieving the above results, Messrs. Merz & McLellan recommend the establishment of a new undertaking with such powers as will enable it gradually to concentrate production, standardise distribution, and bring about amalgamation of all the various undertakings. They recommend that the London County Council should promote a Bill in the next Session of Parliament, empowering some central body to set up an undertaking with powers of bulk-supply and the means of gradually acquiring and amalgamating the different undertakings on commercial terms as far as possible without compulsory powers or competition.

In one of the appendices to the report, the present position of electricity supply in Greater London is reviewed. The total capital in 1912 is given at £25,997,399, of which £8,059,601 has been spent on plant and machinery. The total kilowatts connected is 523,865, the total plant installed represents 307,338 kw., and the sum of the maximum demands 196,721 kw. The average price obtained for all purposes was 2.29d. per unit, varying from 1.96d. as an average of the companies in Outer London, to 2.62d. as the average of the companies within the County of London. The average price obtained by the local authorities was 2.06d., both within the County and in Outer London.

The Bill of the County of London Electric Supply Co. for dealing with the problem of electricity supply in London has been withdrawn by the banking firms which promoted it. As we have already pointed out, all the other London electric supply companies, as well as the London County Council, intended to oppose this scheme when it reached the committee stage in the House of Commons. In a statement which has been issued it is announced that the Bill has been withdrawn "owing to the hostility of the engineers of certain of the London electric supply companies, and to dissensions between these companies which have prevented their combined support." Mr. W. F. Fladgate, Chairman of the Charing Cross, West End, and City Electricity Supply Co., points out, however, in a letter to *Friday's Times*, that this statement is not accurate, as the Boards of all the companies except one were opposed to the Bill. "Also," he says, "it is right to say that there was no hostility on the part of the engineers; the result of their investigations was simply to show that the proposed scheme had not the remotest possibility of financial success. It is noteworthy that in Mr. Merz's report, which you quote, it is suggested that the average price in London for current is 2.35d. per unit, and that this is a high charge. The promoters of the Electric Supply Bill based their estimates on an average revenue of 2.63d. per unit."

**The Lighting of a Cinema Studio.**—As evidencing the uses of electricity in cinematograph studios, the *Electrical Review* and *Western Electrician* (Chicago) gives some particulars of the studios of the Selig Polyscope Co. of Chicago. There are two studios. The main one, in which there are two stages, measures 179 ft. long by 80 ft. wide. On the large stage seven or eight scenes can be set at one time. There are 15 Cooper-Hewitt quartz-tube mercury-vapour lamps in each studio. In the large studio these are hung from a travelling frame about 10 ft. above the floor. Each lamp gives approximately 4,500 c.p. directly underneath. In addition there are banks of ten 800-c.p. mercury-vapour lamps and frames. Usually two of these frames are employed on each side of the scene being photographed. The tubes of these lamps are 50-in. long, and they are placed in a vertical position, arranged to be raised or lowered as required. The light from all the lamps approximates to 100,000 c.p. Leads from the main supply are run to portable distributing boxes, where connections are made for the various banks of lamps. The boxes, as well as the banks of lamps, are on rollers, and can be easily moved. Where necessary, purely local or "spot" lighting is used in addition. Electric motors are used for all the auxiliaries.

**Street Lighting in Large Cities.**—According to the *Electrical World* (New York), Mr. C. F. Lacombe (chief engineer, water, gas, and electricity departments, New York), has stated that much higher illumination is used for street lighting in the large cities of Europe than of America. In London, Paris, and Berlin, the principal streets show intensities as high as 7.9 ft.-candles to 2 ft.-candles near the sources of light, with minima of 0.25 ft.-candle to 0.5 ft.-candle at more remote points. In New York similar streets have maximum intensities not exceeding 1.2 ft.-candles on the road surface, while the minima fall as low as 0.08 ft.-candle. In Fifth Avenue, directly beneath the double-lamp standards, intensities of 1.7 ft.-candles are found, with minima of 0.05 ft.-candle. All high c.p. flame arcs in Europe are placed from 3 ft. to 10 ft. higher than is the practice in America. By this means clear glass globes can be used.

### TESTS ON A KAPP VIBRATOR

IN 1913 Dr. Gisbert Kapp read a Paper before the Institution of Electrical Engineers (*ELECTRICAL ENGINEERING*, Vol. IX., p. 239, May 1st, 1913), in which he described a new form of phase advancer, invented by him, and called the "Kapp Vibrator."

Messrs. Sandycroft, Ltd. (Sandycroft, near Chester), obtained last year a licence for the manufacture of these vibrators, and after careful experimenting have recently completed their first vibrator to be put into regular commercial service. This machine is working in conjunction with a 330-B.H.P. induction motor, built by Siemens Bros. Dynamo

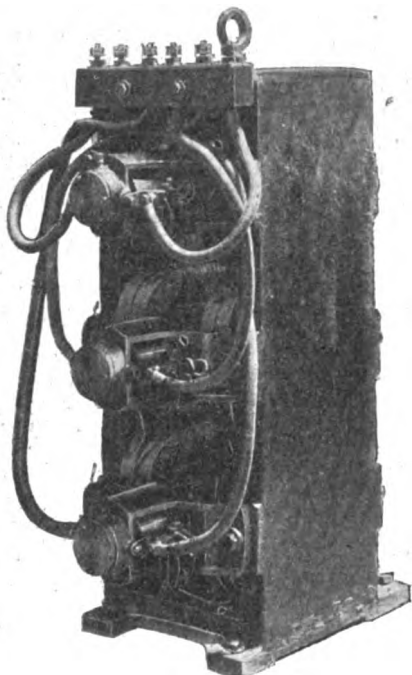


FIG. 1.—KAPP VIBRATOR.

Works, Ltd., and is installed at the Chemical Works, late H. & E. Albert, South Bank, near Middlesbrough. The motor is a 12-pole machine, operated from the system of Cleveland & Durham Electric Power, Ltd., who supply energy at a pressure of 2,750 volts at 40 cycles per second.

The vibrator is a phase advancer, or exciter, for use with induction motors or generators respectively, and consists of a magnet frame carrying three sets of 2-pole field magnets, in which revolve three armatures of the usual continuous-current type. The three armatures are connected in mesh to the slip-rings of the induction motor, as shown in Fig. 2, which shows all the necessary connections. In some cases it may also be desirable to provide an interlocking arrange-

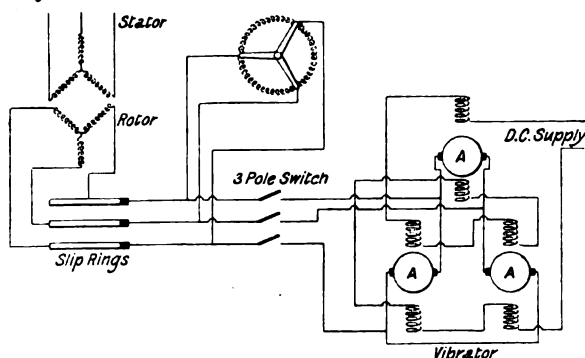


FIG. 2.—DIAGRAM OF ROTOR CIRCUIT WITH KAPP VIBRATOR.

ment, to prevent the motor being started with the vibrator in circuit, that is to say, practically on short-circuit.

The field windings are excited with continuous current. The low-frequency rotor currents in the armatures cause the latter to rotate first in one direction and then in the opposite direction with the frequency of slip. This rotation induces in each armature a voltage which is opposed to the E.M.F. of self-induction of the motor, and is greater than the latter by an amount sufficient to supply through the resistance of the rotor windings the necessary current to produce the magnetic field of the motor. With normal excitation of the

vibrator no magnetising current flows in the stator windings, and consequently the motor operates with a power-factor of unity. If the exciting current be increased the greater voltage then induced by the rotation of the armatures will produce in the rotor windings a magnetising current greater than that necessary to produce the magnetic field of the motor, and consequently a leading current will result in the stator windings.

Fig. 1 shows the actual vibrator in question, which is a small and compact machine. The armatures are only 10 cms. in diameter, and at full load with a slip of 2.45 per cent. rotate about  $3\frac{1}{2}$  revs. in each direction. Since the frequency of supply is 40 cycles per sec., they change their direction of rotation every half second.

The results of the tests made are plotted in Fig. 3, which shows that at half load the power-factor was 0.99 leading, and at full load 0.96 leading. The corresponding power-factors without the vibrator were 0.76 lagging and 0.87 lagging respectively. The machine was guaranteed to give unity power-factor from half load to full load, and when the field current was adjusted for the latter value the excitation loss in the fields of the vibrator was only 50 watts.

The vibrator will work equally well with an induction machine running either as a motor or a generator without

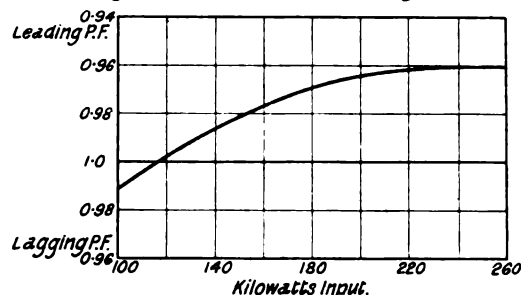


FIG. 3.—POWER FACTOR CURVE OF 330 B.H.P. MOTOR WITH KAPP VIBRATOR.

change of connections, so that when used with machines driving winding engines or locomotives complete compensation would be obtained under all conditions. A valuable feature of the vibrator is that in the event of any mishap (such as, for instance, the failure of the field) it may be left in circuit, even although failing to fulfil its function as a phase advancer, without affecting the running of the motor with which it is installed. The use of a vibrator improves the operating qualities of a motor not only by correcting the power-factor, but also by considerably increasing its overload capacity and maximum torque. Under favourable conditions the efficiency of the motor will be improved. The overload capacity will be increased because not only the stator currents, but also the rotor currents, of the motor will be reduced when the motor is operating above the load corresponding to its maximum power-factor.

The vibrator described above was installed to the order of Cleveland & Durham Electric Power, Ltd., and was built at the works of Messrs. Sandycroft, Ltd., near Chester. By the courtesy of the Chemical Works, late H. & E. Albert, it was inspected on March 20th last by Dr. Kapp and a large number of engineers connected with the Newcastle and Tees-side Local Sections of the Institution of Electrical Engineers.

**Celluloid and Incandescent Lamps.**—The report of the Departmental Committee on Celluloid has been issued by the Home Office, and contains a valuable collection of information as to the inflammability of this widely used material. Amongst other matters, results of tests are given, in which sheets, films, and other celluloid articles were placed in contact with incandescent lamp bulbs. In the case of a 32 c.p. carbon lamp with a bulb temperature of 280° C., a piece of film ignited in 15 seconds, and a piece of transparent sheet in 30 seconds. With a 16 c.p. carbon lamp (bulb temperature 190° C.), all the articles only "fumed off" when placed in contact with the bulb, but films could be ignited in 1 min. 15 secs. by wrapping twice round the lamp. With a 28-watt metal filament lamp (bulb temperature 138° C.), films laid in contact with the lamp were unaffected in one hour, but ignited in  $3\frac{1}{2}$  minutes when wrapped twice round the lamp. The report contains many recommendations regarding safety precautions in factories where celluloid is made or used.

**Iron and Steel Institute.**—The annual meeting of the Institute will be held at the Institution of Civil Engineers on May 7th and 8th inst. Among the Papers down for reading is one by Sir Robert Hadfield and Prof. B. Hopkinson on the "Magnetic and Mechanical Properties of Manganese Steels." The annual dinner will be held on May 7th.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

#### QUESTION No. 1,387.

The primaries of three single-phase transformers are connected up in mesh, and are supplied by a three-phase system. The secondaries, also connected up in mesh, feed a balanced, three-phase, non-inductive load. One primary phase is open circuited on account of an internal breakdown other than a short circuit. What must I do to maintain the supply, and what changes take place in the currents in each of the windings and in the currents in the live wires, assuming the load to remain unaltered?

(Replies must be received not later than first post, Thursday, April 23rd.)

#### ANSWER TO No. 1,385.

A 50-h.p. shunt-wound interpole motor is used for driving a motor-boat direct on the propeller. During some trials with the boat moored, the speed of the motor was 30 per cent. under full speed while the motor was taking full load current. It was impossible to obtain a higher speed than this, as the current rose to a dangerous degree, while the shunt regulator was moved very slightly. Suggest the cause of this loss of speed and control, and state if better results should be expected with a trial under way.—"STOKER."

The first award (10s.) is made to "G. C." for the following reply:—

It does not seem to be realised generally that marine motors are subject to the heavy loads which are obvious with motors driving heavy types of machinery, such as machine tools, &c., and very often purchasers underrate their motors considerably when required for this purpose. Marine motors are certainly not subject to the severe jars as a motor, say, coupled direct to a heavy machine tool. However, the load is by no means light, and when the boat is moored the motor is subject to its heaviest load, as the torque on the motor armature is at its maximum. This is evidently the case with "Stoker." He is assuming that the motor is running practically light, whereas it is taxed to its utmost. It is obvious that if a boat fully loaded will travel through the water in preference to remaining stationary that the moving boat has a lighter load. This could be proved by the following method if same was practical:—Take a trial under way with a light load, and note the input to the motor, then gradually increase the load in the boat by passengers or weights until the motor has not sufficient power to propel the boat. This is equivalent to the boat being moored, as the propeller has to revolve in still water, and cannot cut its way through it. Now measure the input to the motor, and it would be found that the normal current was considerably exceeded, providing the capacity of the supply was able to deal with the increased load, and the shunt regulating resistance had been put in to keep the speed up. If, however, the supply could not cope with the increased current the terminal volts of the motor would fall, and the speed drop in consequence. However, as the motor is fairly large (50 h.p.) the boat is evidently of considerable dimensions, and the above test impracticable, but it could be proved with a boat and motor of smaller dimensions. I suppose "Stoker" is aware that the propeller of a boat is very similar to the

action of a screw thread. If we ignore the slip of the propeller we can give an example as follows:—Take a length of screwed rod and a nut to fit. If the nut is revolved it will run freely up and down the rod, but if any pressure is brought to bear on the nut in the opposite way to which it is travelling it will immediately get difficult to rotate. In the case of the moored boat the propeller is slipping all the time, instead of cutting its way through the water. This can be compared with a motor with a belt drive. If its machine was fixed and could not rotate, the motor pulley would slip the belt. It is well known that the armature current is proportional to the torque on the armature shaft in ft.-lb., and increased torque means increased current. It is perhaps advisable to remind "Stoker" of the relation between torque and current, as expressed in the following formula:— $AE = \frac{T2\pi N}{746 \times 33,000}$  where  $A \times E$  = watts;  $T$  = torque in ft.-lb.;  $N$  = r.p.m.; 746 watts = 1 h.p.; 33,000 ft.-lb. = 1 h.p.

It is obvious from the above that much better results would be obtained with the boat under way.

The second award (5s.) is made to "ALPHA," who writes as follows:—

The rapid increase observed by "Stoker" in the power taken by the motor with a slight decrease of field current is readily accounted for. With a propeller of fixed diameter and pitch the velocity of the stream of water projected backwards will be practically proportional to the speed of the propeller in r.p.m. The kinetic energy in ft.-lb. (per sec.) of this stream of water will be  $\frac{Wv^2}{2g}$ , where  $W$  is the weight in pounds of the water passing through the propeller per sec.,  $v$  is the mean velocity of the water, and  $g = 32.2$ . This energy is all derived from the motor, through the propeller, and since  $W$  is evidently proportional to  $v$ , the power required to drive the propeller will be roughly proportional to the cube of the motor speed. Further, a shunt-wound interpole motor working on a load of this character is apt to be rather unstable, due to the fact that the armature current, and hence the interpole excitation, increases considerably with only a slight decrease of the shunt field current. This relatively large increase in the interpole excitation diverts some of the flux from the main pole to the interpole, thus further weakening the main field. The effect of this is to give a much greater speed increase for a given movement of the field rheostat than would be the case with a normal machine without interpoles. This effect is so marked that it is frequently found that shunt-wound interpole motors increase in speed with increased load, instead of having a slightly drooping characteristic, as in the case of shunt-wound machines without interpoles. To avoid this it is advisable to have a small series winding on the main poles of such machines, this series winding being of sufficient strength to ensure that the speed of the motor will not increase with increasing load. In this case the motor takes full load current at 70 per cent. of the full speed, and since the load is proportional to the cube of the speed, it is evident that the power required at full propeller speed with the boat moored would be approximately three times nominal full load. This is, of course, much more than the motor can be expected to give continuously, and it is probable that even with interpoles the motor would not operate under such an overload, even for a short time. It does not, however, follow that the motor is too small for the duty required, since the power required at full propeller speed with the boat moving will be much less than with the boat moored. The exact ratio between the powers required under the two conditions is difficult to calculate, and will vary widely for different designs of propellers. It will also be affected by the fact that under ordinary conditions the propeller is working in the open water, whereas when moored it may be in a confined space between other boats, or against the dock wall. However, assuming reasonable values for the efficiency and "slip" of the propeller, it would seem that the power required with the boat moored would be probably from two to four times that required at the same propeller speed with the boat free to move. In this case the rating of the motor would be about correct with the boat moving at full speed, but the data given are not sufficient to allow of a definite decision on this point. It would certainly seem, however, that the probability of satisfactory operation is sufficiently great to justify "Stoker" in taking the boat out for a trial under way. If in these circumstances the power taken is not found to be excessive, but trouble is experienced due to instability of the motor speed, a few series turns on the main-field spools as mentioned above would probably cure this.



## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published April 9th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in *italics* indicate communicators of inventions from abroad.

1,505/13. *Ships' Steering Gear*. B.T.-H. Co. (*G.E. Co., U.S.A.*). The motor-controller consists of two independent drum controllers connected by differential gearing, the intermediate element of which can be worked by the steering wheel to set one drum to drive the motor working the rudder, while this motion rotates the other drum so that through the gearing the first drum is brought to its original or "off" position. The motor is fed through a motor-generator whose generator field is varied by a rheostat controlled by the motor-generator shaft through a clutch and holding off magnet. Five figures.

6,286/13. *Purifying Copper*, &c. B.T.-H. Co. (*G.E. Co., U.S.A.*). Copper of a high degree of purity is obtained by melting the copper above a mixture of inert material and boric anhydride. The temperature is kept at about 1,300° C., while the boric anhydride is kept beneath by the inert material and the mass is stirred until the boric anhydride rises to the surface. The process may also be applied to silver, gold, &c.

6,799/13. *Transformer Arrangements*. BRITISH Elec. TRANS. Co. and R. CROSBIE-HILL. In order to provide for pressure regulation without tappings, and to locate damage due to pressure rises in primary or high-pressure windings, small capacity auxiliary transformers are connected in series with the primary of the main transformer, while the secondaries are connected to a supplementary winding associated with both the primary and secondary windings of the main transformer. Two figures.

6,817/13. *Insulated Cables to Stand Climatic Variations*. A. T. MIRZA. Insulating beads, separated by compressible distance pieces are threaded on the cables and sustain a waterproof covering. Five figures.

7,411/13. *Flame Arc Lamps*. G. E. TATE and F. O. MONKHOUSE. Three carbons, two positive and one negative, are arranged obliquely. The negative is engaged at the lower end by a carrier slide which is actuated to strike the arc by a bell crank lever, hinged to a rod which is also pivoted to a rocking lever controlled by the series solenoid. Five figures.

17,490/13. *Resistance Furnace*. F. FISCHER. To heat uniformly large objects on a commercial scale, resistance wires are arranged in the interior of a furnace in contact with an atmosphere of hydrogen, in which also the objects to be heated are placed. Three figures.

24,017/13. *Rotary Printing Press Drive*. SIEMENS-SCHUCKERTWERKE-GES. The drive from auxiliary to main motors is through a flexible belt and spur gearing so arranged that the auxiliary motor is protected from shock, when the teeth of the clutch come into contact, by the slip of the belt. The arrangement is also of use for paper-calendering machines. One figure.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

*Arc Lamps*: B.T.-H. Co. (*G.E. Co., U.S.A.*) 10,304/13; RAILING and ANGOLD, 14,071/13.

*Distributing Systems, Cables and Wires, Insulating Materials, &c.*: DORMER [Protection of D.C. instruments from stray currents] 6,900/13.

*Dynamos, Motors, and Transformers*: B.T.-H. Co., CLOUGH and DUNKER, 7,600/13; SIEMENS DYNAMO WORKS, KOETGEN and KIEFFER [Anchoring windings] 15,148/13; GOLDSCHMIDT [High-speed rotors for H.F. multipolar machines] 17,268/13; HARTMANN [Packing joints of A.C. metal vapour rectifiers] 20,300/13.

*Instruments and Meters*: B.T.-H. Co. and HOLDEN [Indicating appliances] 12,839/13; LUNDGREN [Connections for tariff meters] 15,086/13; KORTING & MATHIESON A.-G. [Meters] 27,875/13.

*Storage Batteries*: DYMOND (*Marquise des Ligneris*) 15,327/13. *Switchgear, Fuses, and Fittings*: WADE (*Schneider & Navjoks Elektrizitäts Ges.*) [Lamp fittings] 7,244/13 and 7,246/13; WILKINSON [Lamp-holders] 10,004/13; THOMPSON and BOWDEN [Time switches] 11,057/13; MARKT [Ceiling roses] 11,755/13; DAY [Fixing shades, &c., to lamp-holders] 12,404/13; HULBERT [Dimming switch] 13,023/13; VALE and BEST [Lighting fittings] 13,249/13; LE COMPTE and HODGSON [Lamp-sockets] 19,916/13; WATSON and VERITYS [Candle lamps] 25,586/13; DEHLER [Pendants] 25,666/13; BÉRAUD [Time switches] 945/14.

*Telephony and Telegraphy*: CHAMBERS [Receivers for wireless] 4,779/13; BRITISH L. M. ERICSSON MFG. Co. and ROGERS [Switches] 6,873/13; GOOD and REBESL Co. [Automatic Morse-recorder] 6,887/13; GRAHAM & LATHAM Co. and SOBOTKA

[Tuning coils] 7,396/13; [Detectors for wireless] 7,977/13; MARCONI and FRANKLIN [Transmitters for wireless] 7,610/13; SIEMENS BROS. and CHRISTIAN [Telephone observation circuits] 9,166/13; HADDAN (*Reineke*) [Mine signalling and telephony] 25,975/13.

*Traction*: BOWEN and CEDES Elec. TRAC. Co. [Overhead lines] 7,305/13.

*Miscellaneous*: B.T.-H. Co. (*G.E. Co., U.S.A.*) [Treating metals] 9,097/13; GYURIS and ALOIS SCHLESINGER [Direct conversion of heat into electricity] 10,036/13; HEINS [Substitution resistances] 10,252/13; EVERSHED & VIGNOLES, KILBOY and NEEDHAM [Automatic timing for stoking of boiler furnaces] 13,228/13; RATEAU [Firing submarine mines] 16,438/13; RAJCZY [Water-gauges] 16,691/13; WHITEHEAD & Co. [Steering torpedoes] 18,859/13; SENFTLEBEN [Submarine mines] 23,504/13; DE LA RIBOISIÈRE [Working door-sashes of automobiles, &c.] 26,060/13; J. ZARUBA & Co. [Primary batteries] 28,734/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

*Distributing Systems, Cables and Wires, Insulating Materials, &c.*: ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEVOIX SOC. ANON. [Starting synchronous and asynchronous machines connected in cascade] 15,875/13; CREIGHTON [Protective devices for distributing systems] 5,542/14; KETTERING [Selective distributing system] 7,465/14.

*Ignition*: UNTERBERG and HELMLE, 13,006/13; HANS, 6,992/14. *Switchgear, Fuses, and Fittings*: PARIS [Electromagnetic switches] 6,425/14.

*Telephony and Telegraphy*: DE BERNOCHI [Working type printing machine by wireless] 3,371/14; MARTIN [Telephony] 6,659/14.

*Traction*: SIEMENS-SCHUCKERTWERKE GES. [Suspension and tension of contact lines] 4,523/14; YSEBOODT [Block signalling] 6,494/14.

*Miscellaneous*: BECKMANN [Magnetic tachometers] 3,020/14; DEAN [Hooters] 5,346/14; WATERS [Route indicating lamps for vehicles] 7,090/14.

The following Amended Specification may now be obtained:—

Telephony: E. A. GRAHAM and W. J. RICKETS, 2,610/13.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

7,108 of April 17th, 1900. *Ignition Magnetos*. F. R. SIMMS and R. BOSCH. The armature is continuously revolved by being fixed to a plate on the engine shaft or on a countershaft driven from the engine shaft. Where the current is generated by the rotation of an envelope the armature is fixed to one end plate and the envelope to another, driven as before.

7,272 of April 19th, 1900. *Electrolysis*. H. BAKER. Rigid contact plates are clamped to carbon electrodes used in electrolytic processes, so that a permanent reliable contact is obtained.

7,284 of April 19th, 1900. *Sirens*. W. MAY and PULSOMETER ENGRG. Co. A steam siren is arranged to be controlled by a valve worked by hand or electromagnetically.

The following are the more important Patents that have become void through non-payment of renewal fees.

*Arc Lamps*: C. SMART [Suspension] 27,180/05.

*Distributing Systems, Cables and Wires, Insulating Materials, &c.*: R. LUNDELL [A.C. commutator motor speed control] 26,808/05; H. LEITNER [Battery-dynamo train lighting system] 29,758/06; O. C. IMMISCH [Re-manufacture of old or waste ebonite and vulcanite] 28,365/07.

*Dynamos, Motors, and Transformers*: VERITYS and D. E. ROGERS [Adjustable box-type carbon brush-holders] 28,336/04.

*Electrochemistry and Electrometallurgy*: A. VOELKER [Glass-making resistance furnace] 28,276/08.

*Instruments and Meters*: W. B. THORPE [Differential electromagnetic registering mechanism, also applicable to the control of switches, recorders, &c.] 28,561/08.

*Telephony and Telegraphy*: F. RITCHIE [Relay in which a first small movement of the armature is reinforced by a local current. This relay may be used for pen lifting in the telewriter, &c.] 28,255/04; A. MUIRHEAD [Duplex submarine telegraphy] 27,867/08.

*Miscellaneous*: L. I. BLAKE and L. N. MORSCHER [Electrostatic separator for precious metals] 23,878/00; V. G. MIDDLETON (*A. J. East, Bermudas*) [Remote indication of liquid levels] 28,973/04; W. H. COON [Massage apparatus] 26,878/05; A. P. STECKEL [Brake and clutch] 28,130/08; W. D. and F. G. BOWMAN [Time recorder for use in certain cases during working hours] 28,228/08; S. BENKÖ [Primary batteries] 28,290/08; R. B. MATTHEWS [Friction-driven gearing for electro-motors adapted for domestic use] 28,420/08.

## THE B.E.A.M.A. AND THE HOME OFFICE REGULATIONS

IN view of certain difficulties which had arisen regarding the interpretation of the Electricity Regulations of the Home Office under the Factory Acts, a sub-committee of the Switchgear Section of the British Electrical and Allied Manufacturers' Association recently discussed the questions involved with Mr. G. S. Ram (H.M. Electrical Inspector of Factories), and as a result all the questions of interpretation have been set at rest, and Mr. Ram's replies are to be embodied in the next edition of his memorandum on the Regulations.

The first question was whether armouring or protecting cables interconnecting two E.H.T. switchboards in a station is required under Regulation 2, and Mr. Ram points out that this is advisable, and further adds that unarmoured cables when in trenches or on switchboards should be separated by fire-resisting divisions. In reply to another question relating to Regulation 5, the use of main fuses behind panels of low and medium pressure switchboards is stated to be undesirable in view of their possible effect under short-circuit conditions upon neighbouring conductors. Instrument fuses on the back of the board should be of the enclosed or cartridge type, and unless protected by a switch should be constructed so that they can be handled without danger of touching the live parts. A question also arose under Regulation 15 as to the interpretation of the expression "set apart for the purposes thereof," in connection with switchgear, which defines the area within which switchboards must be fenced. This is now declared not to apply to isolated auxiliary boards, such as those near rotary converters, in a boiler-house, &c., and it is required that these be fenced if they are placed where people are liable to pass close to them for purposes other than attendance thereon. In reply to a question whether boards of not more than two panels may be placed close to a wall without a passage-way, but so that they can be inspected from either side, Mr. Ram considers the practice undesirable for boards that cannot be made dead, except where all connections and parts which may require attention are at the front. Referring also to Regulation 17, it is considered desirable that the passage-way behind E.H.T. boards should provide a means of exit at either end, especially in large power stations. In stations of moderate power, however, where the passage-way is two or three times the minimum width, a second means of access may be unnecessary. In another reply on the subject of protection of switchgear cells by screens or doors it is recommended that lift off screens be made of non-metallic material, such as asbestos plate. Hinged doors should open 180°, and there should be at least 15 inches space between the edge of the door when open 90°, and the opposite wall of the passage. Where necessary to provide this clearance, double doors, hinged on either side, may be used. Sliding doors may conveniently be arranged on two lines of runners, and should be hung alternately on the front and back runners, so that any door may be opened without having to move others. Doors of expanded metal are approved of. Even in locked enclosures, where only authorised persons have access, permanent cell doors are preferable to the use of removable screens. It is further recommended that isolating switches be installed in separate compartments from the apparatus which they isolate, but where temporary screens must be used on existing boards for screening off the live side of the isolating switches, safe means should be provided for their insertion by the provision of suitable guides. Another subject taken up was in what circumstances are barriers required between adjacent phases, to which the reply was that divisions were desirable between phases at all places where an arc was liable to be started accidentally, such as at isolating switches. It was recommended that isolating switches be placed on both sides of oil switches on feeder circuits, where the feeders are capable of being made live from the distant end. Potential transformers with attached fuses should be protected by isolating switches in a separate compartment. This last point arose chiefly from Regulation 5, and another question under the same regulation was whether combined traction and three-wire supply boards, with the traction negative and supply middle wire earthed, and more than 650 volts between the traction position, and one of the supply outers, are to be regarded as high pressure switchboards. As the two systems in such a case are quite distinct it was replied that the high-tension regulations do not apply.

## ANNUAL PATENTS REPORT

The thirty-first report of the Controller-General of Patents for the year 1913 is now available. Among the subjects of an electrical nature in which "inventors have shown special interest" are the construction of small dynamos for lighting automobiles and for starting the engine, and railway signalling. More than treble the number of applications for patents for the latter were made in 1913 compared with 1912. These related mainly to automatic signalling and train-stops.

A number of inventions dealing with mine signalling were also received. The total number of applications from all sources was 80,077, compared with 80,089 in 1912. The total number of complete specifications received was 19,809, compared with 18,858 in 1912, an increase of 2.4 per cent. The proportion of complete to provisional specifications filed on application continued to increase, and was nearly 53 per cent. in 1913, compared with 52 per cent. in 1912. Applications for patents by persons resident in the United Kingdom numbered 20,426 in 1913 and 20,174 in 1912, while the figures for Germany during these years were 8,167 and 8,169 respectively; for France, 1,148 and 1,097; and for the United States 2,646 and 2,986. The total number of applications under the International Convention was 8,673 in 1913, compared with 8,272 in 1912, being divided as follows:—Germany, 1,528 and 1,366; France, 669 and 602; United States, 635 and 644; Belgium, 203 and 155; Austria, 180 and 175. It is interesting to note that of the complete specifications filed in 1913, no less than 1,174 were reported as wholly anticipated, 10,903 as partly anticipated, and 5,330 as not anticipated. Of those anticipated, 11,008 were amended without a hearing, and 650 after a hearing and decision. There are now two patents of electrical interest prolonged beyond the customary fourteen years maximum life—Nos. 11,575/97, by Sir O. J. Lodge, relating to wireless, and 24,048/99, by F. Ritchie, relating to the telewriter.

## ELECTRIC TRACTION NOTES

A Board of Trade report by Col. Von Donop has been issued regarding a derailment of a tramcar at Manchester on Feb. 25th. The inspector attributes the accident to the excessive speed at which the driver allowed the car to enter the curve.

A Board of Trade report on a tramcar derailment in Dublin on February 1st has just been issued. The car was derailed on a curve about 45 yds. from facing points, electromagnetically controlled from the car. The Board of Trade regulations restrict the speed to 4 m.p.h. through facing points, and the Company's to 2 m.p.h. on curves, points, and crossings. The points are controlled by the "Tierney-Malone" controller. When the car is about 50 ft. away, its trolley makes contact with a metal ramp secured to the trolley wire, and if at that time the controller is set in one of the working positions, a solenoid in an iron box in the road is energised and shifts the points. The points are similarly restored to their normal position when the car has passed. Lt.-Col. P. G. Von Donop, who conducted the inquiry, concludes from the evidence that the points, for some reason which cannot be definitely ascertained, were not lying in their normal position for the straight-through road—this might have occurred by their having been maliciously moved, or by the driver not having his controller in the "off" position—and to the fact that the speed of the car was too high, probably 5 or 6 m.p.h., to allow of the driver's ascertaining their position, and stopping the car before running through, as well as to the sudden application of the Westinghouse magnetic track brake when running round the curve.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

There is now, says *Telephony* (Chicago), one telephone for every 15.2 persons in Canada, according to a statistical report issued by the comptroller of statistics in the railway dept. of Canada. There are 1,075 private, co-operative, or municipal telephone organisations. During the past year seventeen new municipal services, 129 co-operative services, 175 joint stock services, and thirty-two partnership services, were established. There are 1,092,587 miles of wire in use, with 463,671 telephones. Of these 269,843 are of the central-battery type, and 193,828 of the magneto type.

The Poulsen wireless stations in County Kerry and New Brunswick are nearing completion, and should be working in May. By a contract with the Canadian Government the minimum speed of transmission is to be 400 letters per minute.

The report of the American Marconi Co. for the period ending December 31st, 1913, shows that only 1.9 per cent. profit was earned on the share capital. No dividend is recom-

mended. Patents, patent rights and goodwill appear in the books as representing over 25 per cent. of the total assets. An arrangement has been made with the Western Union Telegraph Co. whereby messages will be sent between New York, San Francisco, Boston, &c., by the new wireless stations in New Jersey, California, and Massachusetts. Attention is drawn to the fact that efforts are being made to build up a railway business by the establishment of wireless equipment on trains.

The Union Government is considering the establishment of a wireless station at Springs, east of Johannesburg, to communicate with Nairobi and thence to Malta.

Work is to be commenced forthwith on the stations in the French Inter-Colonial wireless chain. The range of most of the stations is to be between 2,000 and 3,000 miles, and the principal stations will be at Timbuctoo, Bangui, Jibuti, Antananarivo (Madagascar), Pondicherry, Saigon, Noumea

(New Caledonia), Papeete, the Marquesas Islands, and Martinique.

MM. Ducretet and Roger have devised an apparatus for the automatic reception and recording of wireless signals. An electrolytic detector and an electro-magnetic relay control a Morse ink. It is said that messages from the Eiffel Tower can be recorded at distances up to 500 kilometres.

A wireless installation is being erected at the Wolf lighthouse for communication with the mainland. It is proposed also to erect one at the Longships lighthouse off Land's End.

A wireless station is to be erected near Stonehaven, Kincardineshire. This will be available for telegrams to the north if the main overhead lines are interrupted.

The Portuguese Colonial Minister states that the line from Santo Antonio do Zaire Noqui is down, and that telegrams for Jala and Noque, Portuguese Angola, and the Belgian Congo are being sent *via* Libreville during this interruption.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 221. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**FLAME ARC LAMPS.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), has issued a supplementary bulletin dealing with the recent improvements which have been made in "Angold" magazine flame arc lamps for alternating-current circuits. As these lamps only work in parallel no substitution resistance is required, and the mechanism has no shunt coil, as an internal autotransformer is fitted, thus maintaining a constant pressure across the arc and keeping each lamp as a complete unit. Several improvements in details of construction have been made. The mean lower hemispherical candle-power for the 8-ampere lamp is 1,150, for the 10-ampere lamp 1,524, and for the 12-ampere lamp 2,040. Burning hours vary from 65 to 80, according to the type used.

**DRY BATTERIES.**—The Battery Department of the General Electric Co., Ltd., has just published a leaflet dealing with "Witton" dry batteries and others. The former is set up for 4½ volts, and is very convenient for bell work, &c.

**"GEEKO" COMPANION SET.**—A further leaflet from the Novelties Department of the General Electric Co., Ltd., calls attention to the neat "Geeko" companion set, which may be used as a bell, hand-lamp, night-light, or alarm clock.

**AUTOMOBILE LAMPS.**—The British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), have issued a new folder giving particulars of their well-known Mazda drawn-wire lamps for lighting automobiles. The list, which is well arranged, deals with lamps for headlights, side-lights, tail and dash lights, and steering pillar lights, as well as in the festoon, dome, and tubular forms for car interior lighting.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**AIR FILTERS.**—We are in receipt of a Dry Air Filter Catalogue from Balcke & Co., Ltd. (Broadway Court, Broadway, Westminster, S.W.). The publication, which is illustrated, deals with the construction and uses of the company's patent dry-air filters for dynamo-electric machinery. We are informed that the company has supplied to date dry-air filters aggregating a capacity of 79,357,200 cub. ft. of air per hour, including two plants, each dealing with 7,500,000 cub. ft. of air per hour.

**WIRING ACCESSORIES.**—The British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), have just issued a price list of wiring accessories, which are now being offered at reduced prices. Samples can be seen at Mazda House. They embrace standard accessories, shades, and reflectors, fittings and parts, bell materials, odd pieces of wires and cables, as well as miscellaneous accessories, including telegraph insulators, screws, asbestos string, &c.

**TELEPHONE ARM.**—A publication of the Sterling Telephone & Electric Co., Ltd. (210-212 Tottenham Court Road, W.), deals with the Equipoise telephone arm for office use. The construction is simple and gives a strong article, which is self-balancing and is readily fixed to woodwork in any position, the telephone

itself being kept clear of desk or table. The finish is in dull black and nickel-plate. Accessory extensions to meet difficult positions can be obtained at a small additional cost.

**"THE BRUSH BUDGET."**—The March issue of this illustrated periodical of the Brush Electrical Engineering Co. (Loughborough) contains, among other matters, illustrations showing the form of blading used in the Ljungstrom turbine and some new cars recently supplied to the Baker Street and Waterloo Railway.

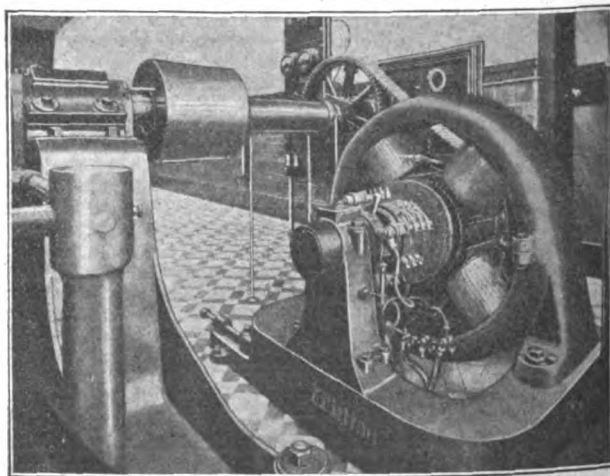
**VENTILATION.**—A new catalogue from Ozonair, Ltd. (96 Victoria Street, S.W.), contains particulars of a considerable range of ozone-producing apparatus, and fans for use in various circumstances.

**TECHNICAL BOOKS.**—A second supplementary catalogue has been issued by Lewis's Medical & Scientific Circulating Library (136 Gower Street, W.C.). The publication includes a classified index of subjects with the names of the authors who have treated upon them. There are a number of books dealing with engineering subjects.

**AN OSRAM BLOTTER.**—The Osram Lamp Department of the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), is sending out a 24-page blotting book. On each right-hand page is a caricature of the properties of Osram lamps, and some notes addressed to those who are interested in their sale. The Company is pleased to forward one of these blotters to any applicant in the trade who cares to have one.

### LIGHTING OF WEAVING SHEDS

MANY textile manufacturers who have not yet converted their plant to electric drive nevertheless desire to lay down an electrical installation for lighting their mills. The



GENERATOR DRIVEN FROM SHAFTING OF A STEAM-DRIVEN MILL USED FOR LIGHTING.

advantages over gas for such work are undeniable, and it is found that electricity can show a considerable economy.

For the electric lighting installation three alternative schemes are open:—Electricity may be bought from the local power-supply company or municipality; a small steam set may be laid down, supplied with steam from the main boilers; or a generator may be driven from the main mill engine. The first scheme is usually ruled out by the high cost of current for lighting purposes only, seldom less than 8d. per kw.-hour. An examination of the relative costs shows that either of the two latter methods are to be preferred, the only advantage which can be urged in favour of the first being that the service from the power supply company is rather more reliable than from the mill engine itself. The choice, then, really lies between the two alternatives, of which, on investigation, the second is to be preferred, since the power required for electric lighting is usually negligible compared with the capacity of the mill engine, and it is introducing unnecessary complications to lay down a special steam set for electric lighting. A typical example of a textile mill illuminated on these lines is afforded by the Leigh Manufacturing Co.'s sheds, where the third scheme has recently been successfully carried out by Mr. R. S. Greenhalgh, Consulting Engineer, of Atherton. As will be seen from the accompanying illustration, a 30-kw. "Witton" generator supplying power at 220 volts is driven through a Hans Renold silent chain from the main shaft of the mill engine, and is situated in the engine-house. In the illustration a view of the generator is given, with cover removed from the gear-case. So successful has the installation been that the electricity is being generated at a cost of 0'6d. per unit, including interest and depreciation. The generator and the switchboard for this installation were supplied by the General Electric Co., Ltd., of Victoria Bridge, Manchester, Witton, and 67 Queen Victoria Street, E.C.

### A LARGE CABLE CONTRACT

THE contract for supplying and laying the whole of the cables in connection with the conversion to electric traction of the Buenos Ayres Western Railway Suburban System has been secured by W. T. Henley's Telegraph Works Co., Ltd., which firm, it will be remembered, also secured a similar contract in connection with the electrification of the suburban lines of the Central Argentine Railway, the cables for this latter undertaking being now in course of installation. The Buenos Ayres Western Railway system will be worked at a line-pressure of 800 volts direct-current. Energy will be generated at 2,500 volts 25 cycles, transformed to 20,000 volts by step-up transformers, and transmitted to five sub-stations equipped with rotary-converters. The feeders to two sub-stations will be run in duplicate. The principal cable item is one of approximately 116,000 metres of 10 sq. in. three-core, split-conductor, paper-insulated, lead-covered, and steel-wire armoured cable, which is to be used for feeders at the working pressure of 20,000 volts. This cable will be tested after twenty-four hours' immersion in water up to 50,000 volts, and a sample piece cut from any drum selected by the Consulting Engineers is to withstand a test pressure of 100,000 volts. It will be laid direct in the ground at a depth of 1 metre, further protection from mechanical damage being afforded by 2-in. creosoted boards being placed over the cables. At cross culverts and level crossings the cables will be drawn through cast-iron pipes, and where they run across bridges they will be hung on racks and protected from the sun's rays by sheet-iron. All joints will be of the vacuum type in gunmetal sleeves similar to those adopted for the Central Argentine Railway cable. The track cable consists of about 17,000 metres of single-core, paper-insulated cable, part of which will be lead-covered and single-wire armoured, and part sheathed with vulcanised bitumen, taped, braided, and laid solid in fibre troughing. This track cable will, of course, feed the conductor rails and connect across breaks in the rails at level crossings, junctions, &c. The contract also includes the supplying and laying of about 58,000 metres of dry core, lead-covered, and wire-armoured telephone cable with the necessary terminal boxes, pillars, telephone apparatus, and accessories, of which a very large quantity will be wanted. We understand that this is the largest contract ever placed for a power cable installation, and following as it does in the wake of the Central Argentine Railway contract secured by the same firm, which at the time it was placed was a record contract, enables Henley's to beat their own record. Moreover, the portion of the work that has been put in hand by the Railway Co. represents a part only of the complete scheme. If the Railway Co. eventually decide to carry out the complete scheme, the value of the

contract will be very considerably increased. The work is to be completed in sixteen months, and it will call for the services of a large number of engineers, joiners, &c. Messrs. Livesey, Son & Henderson and Messrs. Merz and McLellan are the Consulting Engineers for the complete scheme.

### UNDERGROUND STATION LIGHTING

THROUGH the courtesy of the General Electric Co., Ltd., who are in turn indebted to the Underground Railways for permission to take photographs, we are able to reproduce some illustrations of the reconstructed Charing Cross station of the Underground Railways, which now forms a connecting-

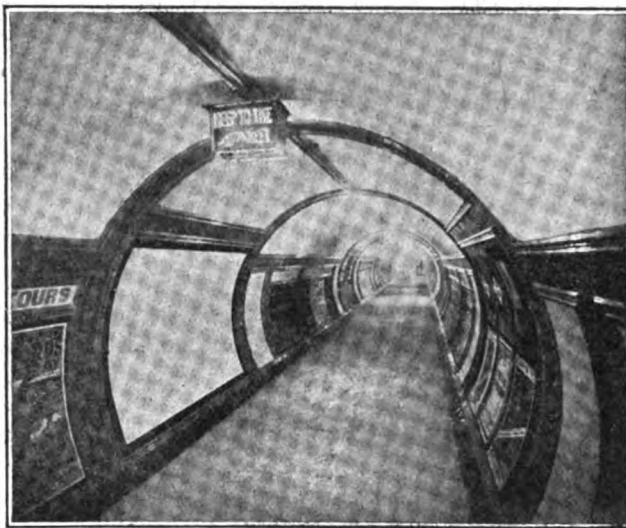


FIG. 1.—CORRIDOR CONNECTING HAMPSTEAD AND BAKERLOO LINES, CHARING CROSS.

link between the District, Bakerloo, and Hampstead lines, since the completion of the extension of the last-mentioned. This piece of line has been in process of construction since the latter part of 1911, and is about half a mile in length, running from the original terminus of the Hampstead Railway at Charing Cross, underneath the length of Villiers Street, and then loops round to a new single-platform station constructed about 50 yds. to the east of the Bakerloo line. The figures show the corridor connecting the Bakerloo and Hamp-

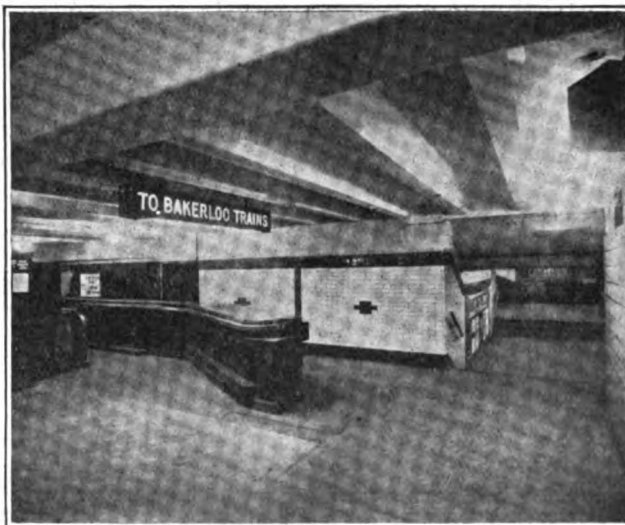


FIG. 2.—TOP OF ESCALATOR, CHARING CROSS.

stead lines, and the top of the escalator at Charing Cross, by which passengers descend from the District line to the Bakerloo or Hampstead lines, or *vice versa*. These illustrations were taken solely by the light of the ordinary installation. In the case of the corridor the illumination is effected by means of Osram drawn-wire lamps enclosed in G.E.C. "Superlux" globes, and in the case of the booking hall at the top of the escalator the illumination is again effected by Osram lamps in "Superlux" bowls. A remarkably even distribution of illumination is obtained.



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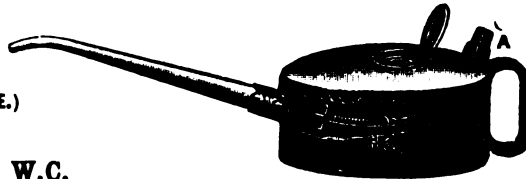
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### REFLECTORS FOR HALF-WATT LAMPS

WE are in receipt of an advance copy of a sectional list, dealing with Benjamin steel reflectors and Goliath lamp-holders for half-watt lamps, from the Benjamin Electric, Ltd. (1A Rosebery Avenue, E.C.). This extension of the Benjamin steel line of reflectors is particularly designed for



FIG. 1.—INTENSIVE STEEL  
REFLECTOR FOR HALF-WATT  
LAMPS.



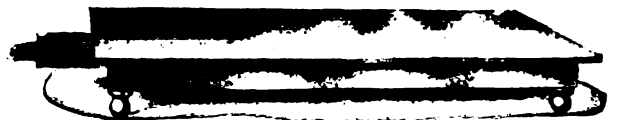
FIG. 2.—PORCELAIN GOLIATH  
SCREW LAMP-HOLDER, WITH  
CONCEALED TERMINALS, FOR  
HALF-WATT LAMPS.

use in factories and similar interior lighting. The porcelain Goliath lamp-holders are able to carry 15 amperes at 100 volts, and can be supplied with either open or concealed terminals, with various flanges, and the well-known lamp-grip feature. We illustrate the intensive type of steel reflector and the neat Goliath holder with concealed terminals.

**Crystal Palace School of Practical Engineering.**—Particulars of the engineering course, which commences on April 29th, can now be obtained on application to the Registrar, School of Engineering, Crystal Palace, S.E.

### ELECTRIC GRIDDLE PLATES

AMONGST the several new items on the "Plexsim" system, being placed on the market by the electric Heating and Cooking Department of Simplex Conduits, Ltd., attention may be drawn to a range of griddle plates, such as the one illustrated here. They are rectangular in shape, finished in black, with a planed metal top; a useful size for



PLEXSIM ELECTRIC GRIDDLE PLATE.

the house, being 16 in. long by 8 in. wide, taking 1,000 watts. Temperature regulation is provided for by three pin terminals. Marble connectors are used, and the plates are supported on insulating feet. The largest size is 24 in. by 12 in., taking 2,500 watts at full load, and prices will be quoted for special sizes on request. The neat appearance of this apparatus is seen in the illustration, which represents a medium-sized plate.

**Magnetite Arc Lamps.**—It is stated in the *General Electric Review* (Schnectady), that during the past few years much research work has been done in the direction of increasing the efficiency of magnetite arc lamps. Two lines of investigation have been followed, bearing on the production of electrodes to support an arc at a higher efficiency than that of present lamps: (1) Utilising standard lamps, and (2) without regard to this condition. It is anticipated that both lines of research have been successful, and that electrodes will shortly be on the market, giving an efficiency of about 0.5 watts per c.p. Higher efficiencies are regarded as possible with a modified lamp mechanism. Although such efficiencies as 0.2 to 0.25 watt per mean hemispherical c.p. are not immediately available commercially, they may be regarded as reasonably sure of attainment in a short time.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Blackrock.**—The Council invites tenders for two (Diesel engines) generating sets, booster, battery, switchboard, &c. Consulting Engineer, J. P. Tierney, 15 College Green, Dublin. April 28rd.

**Braintree.**—An electric lighting scheme has been placed before the Council by Mr. H. P. Girling, consulting engineer, of Maldon. Alternative schemes costing between £9,000 and £14,000 have been prepared.

**Burton-on-Trent.**—An expenditure of £7,000 is contemplated on the electricity undertaking.

**Oriccieth.**—An electric lighting scheme is under consideration.

**Malvern.**—The Council has decided not to negotiate with the Worcester Corporation for a supply in bulk, but to apply to the L.G.B. for a loan of £1,500 with a view to installing a 150-kw. set.

**Manchester.**—One 5,000-kw. turbo-alternator with pipework, pumps and condensing plant. Chief Electrical Engineer. May 18th.

**New Zealand.**—According to the *Board of Trade Journal*, new generating plant is required by the Wallington, Dunedin, and Hastings Councils.

**Ruthin.**—An electric lighting order has been granted for this district.

**Torquay.**—Additional steam-raising plant is to be installed immediately. Mr. C. W. Salt, the Electrical Engineer reporting upon the extensions for 1915-16, says that the best plan would be to erect an entirely new works, but as this would entail an outlay of some £35,000 he does not think the financial results would justify it. Therefore, it is recommended that extensions be carried out on the present site at an expenditure of some £16,000.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bacup.**—New municipal offices.

**Bradford.**—New hall, Morley Street. City Architect. April 28rd.

**Caerphilly.**—New police station. Clerk, County Council, Cardiff.

**Dundee.**—New city hall.

**Eccles.**—New municipal offices.

**London: Marylebone.**—Block of flats, 8 to 12 Manchester Street. Architect, H. J. Colebrooke.

**Reading.**—New factory (£55,000). Co-operative Wholesale Society, Manchester.

**Skegness.**—Cinematograph theatre. Architect, F. A. Tugwell.

**Stockport.**—New school.

### Miscellaneous

**Bacup.**—An important scheme for street lighting by metal-filament lamps has been adopted by the Council.

**Bulgaria.**—A telephone service is to be established between Sofia and Constantinople.

**Malton (Yorks).**—Tenders are invited for the lighting of this district for three years. Surveyor, Town Hall.

**Mexborough.**—The preliminary arrangements for the construction of the two railless traction routes, sanctioned last year, are in hand.

**Power Press Guards.**—Veritys, Ltd. (Plume & Victoria Works, Aston, Birmingham), send us some particulars of a new guard for power presses which, in view of the activity of the factory inspectors in enforcing the regulations as to the proper protection of such machinery, should find considerable application. The front of this is in the form of a gate which swings open when the press is at the top of its stroke, but closes when it begins to descend, so that a complete cage is formed round the tools. The construction is very simple, and the method by which it is opened and closed is very ingenious.

## TENDERS RECEIVED AND ACCEPTED

**Belfast.**—The General Electric Co. has received the annual contract for electrical accessories for the Tramways Department.

**Farnworth.**—A contract for new generating plant has been placed with the British Westinghouse Co.

**London: St. Pancras.**—The following tenders are recommended for acceptance:—The Sloan Electrical Co., 65,000 pairs of 10-in. open-type carbons, and 140,000 pairs of 12-in. open-type carbons, at £669 17s. 6d.; General Electric Co., 50,000 pairs of flame-arc carbons for the "Angold" lamps, at £216 5s.; Siemens Bros. & Co., 1,600 pairs of flame-arc carbons for the "Beacon" lamps, at £18 6s.

**South Africa.**—The General Electric Co. has received a contract for the whole of the plant and equipment for the municipal electric lighting scheme of Ermelo.

Messrs. Chamberlain & Hookham have received contracts for meters for the ensuing year at West Hartlepool, Pembroke, Halifax, Barrow, Mansfield, Newport, and Belfast.

## APPOINTMENTS AND PERSONAL NOTES

Mr. Ashton Bremner has severed his connection with the Hydro Electric Co. of Tasmania, and has been appointed Chief Engineer of the Marine Board of Mersey, Devonport, Tasmania.

Mr. Oliver Henry Kennedy, of the Marine Department, Messrs. Siemens Bros. Dynamo Works, Ltd. (66 Waterloo Street, Glasgow), was presented by the members of the Glasgow office staff with a silver tea set, on the occasion of his approaching marriage to Miss J. T. Muir, of Wimbledon.

Mr. A. E. Wray, Assistant Manager of the South Metropolitan Electric Tramways & Lighting Co., has been presented with a clock and an illuminated address on the occasion of his leaving to take up the appointment of Manager and Engineer to the Gravesend and Northfleet Tramways Co.

An engineer and manager is required by the Clones Electric Light & Power Co.

Shift engineer required for electric power station in South Europe. (See advertisement on another page.)

A locomotive draughtsman is required, with experience of electric locomotive work. (See advertisement on another page.)

A switchboard attendant is required for L.C.C. tramway sub-stations. (See advertisement on another page.)

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Brush Electrical Engineering Co.**—A substantial improvement is shown for the year 1913, there being a net profit of £20,061 14s. after providing for debenture interest. This result is due primarily to more satisfactory prices having ruled. It is recommended that the sum of £12,351 17s. be provided for depreciation in respect of the last two years, and the balance in reduction of the amount standing to the debit of profit and loss account.

**General Electric Co.**—The recent issue of new capital was largely oversubscribed.

**South Wales Electrical Power Distribution Co.**—The report and accounts for 1913 show a surplus of £2,915 after meeting depreciation. The sum on hand now amounts to £10,379 towards meeting indebtedness to certain consumers of the Treforest Co., amounting to £13,500. The Company is applying to the Board of Trade for a number of provisional orders in the South Wales area.

**Babcock & Wilcox.**—The net profit for 1913 amounted to £446,073. An interim dividend has already been paid on the ordinary shares, and a final dividend of 9 per cent. for the second half year is now recommended. After placing £50,000 to reserve fund and £10,000 to staff pension fund, a balance of £73,834 is carried forward. The business continues to progress, and the orders in hand on January 1st this year were in excess of those carried over at the 1st of January, 1913.

## LOCAL NOTES

**Accrington: Span-Wire Lighting.**—The Council is abandoning the use of the span-wire system of lighting in main roads, and is putting lamps on tramway standards.

**Bromley: Electric Cooking.**—At the annual meeting of the Bromley (Kent) Electric Lighting & Power Co. last week, special reference was made to the progress in the district in the use of electricity for heating and cooking, the charge for which is now 1½d. per unit.

**Copenhagen: Power Supply.**—It is stated that the agreement between the South Swedish Power Co. and the North Zealand Electric Works for conveying some 15,000 h.p. of electric current from Lagan, in Sweden, by means of a submarine cable, for lighting North Zealand, has been sanctioned by both the Swedish and Danish Governments. The distance across the Sound is 7 kilometres.

**Dartford: Electricity Undertaking.**—There has been considerable criticism recently of the management of the electricity undertaking, particularly in regard to one or two large power contracts which the Engineer recommended the Council to enter into. Consequently, Mr. J. F. C. Snell was called in to report upon the general position of the undertaking, which has shown a diminishing profit during the past few years. Mr. Snell reports that the Electricity Department is very carefully and ably managed by Mr. Pember who, he adds, deserves the full confidence of his Committee and the Council. All that is wanted is expansion of business, and then the department cannot fail to be financially successful. It is for this reason that the Council is recommended to proceed with certain large power contracts on the basis of £4 5s. per kw. plus 6½d. per unit, the energy being metered three-phase high-tension. These works, which are at Crayford, would involve the installation of a 500-kw. turbo-alternator with 10,000 volts transmission. Mr. Snell recommends that the periods for the proposed contracts should not be less than seven years, and also that there should be a coal clause in them.

**Ellon: Electric Lighting.**—The Council has instructed Messrs. T. C. Smith & Co. to proceed with the electric lighting scheme recently discussed.

**Farnworth: Electricity Progress.**—In order to meet the increasing demands on its electricity undertaking, the Council is extending the agreement with the Lancashire Electric Power Co. in order to obtain a further supply of current.

**London: Marylebone.**—The Electricity Department is offering to supply electric irons, toasters, or kettles, the method of payment for same being to add 5s. to the electricity account each quarter until the amount is paid off. No charge is to be made for interest on amount outstanding. This is a somewhat new departure, and is the result of a suggestion from a "live" man in the department.

**Lytham: Electric Supply.**—The Council is still undecided whether to instal its own generating plant or to have a supply in bulk from the St. Anne's-on-Sea Council. A short time ago an offer from St. Anne's was refused, but more favourable terms have now been offered.

**Redditch: Electricity Undertaking.**—Messrs. Hancock & Dykes, the Council's consulting engineers, have now reported upon the position of the electricity undertaking. They criticise the high coal consumption per unit sold, viz., 11'3 lb., and refer to the impossibility of opening any of the plant for internal inspection as there is no stand-by. With regard to mains, the high-tension cables are in a passable condition, but will not long continue to serve their purpose unless relief mains are laid. The sub-stations below the streets are badly arranged and immediate steps are required to ensure the safety of the workmen. If these sub-stations are retained the interiors should be practically rebuilt and rearranged. There are many opportunities for leakage on the distributors, and the lack of uniformity in the pattern of meters now in use does not conduce to efficient administration. A meter-testing department is recommended, as well as periodical tests of meters. Messrs. Hancock & Dykes do not recommend the Council to entertain the question of purchase, as they doubt if they would find a purchaser to pay more than the outstanding debt on the undertaking. The alternative of moving the existing works to another site is regarded as impracticable, and they recommend an outlay of £18,000 upon remodelling the existing plant and installing additional plant. In addition, they suggest that the charges for current for all purposes should be advanced by 12½ per cent., which would yield an average of 1'65d. as against the present 1'47d. Even with this advance the consulting engineers are

confident that electricity will be able, in Redditch, to compete with any other form of power.

**Saddleworth: Electric Supply.**—Negotiations have been carried on with the Stalybridge, Hyde, Mossley and Dukinfield Electricity Board for a supply of electricity in bulk.

**Scarborough: Purchase of Supply Co.**—Negotiations are now actually being carried on with regard to the purchase of the local electric supply company.

**Torpoint: Electric Lighting.**—The Council has entered into an agreement for an electric lighting installation to be started in the town by some private promoters.

**Turton: Lighting Small Houses.**—A scheme for lighting small houses at a charge of 7s. per quarter, irrespective of the amount of current used, is being developed.

**Wednesbury: "Free" Wiring.**—The Electricity Committee recommends that the "free" wiring of consumers' premises shall be discontinued. The Committee thinks it better to offer more attractive terms in other directions. It also recommends that the present system of supplying to small houses at an inclusive charge of 10d. per week during December and January, and on a sliding scale to 5d. per week in June and July, be discontinued as regards new houses, and that the charge to the existing consumers on this system be increased to 1s. and 8d. respectively, all renewals being paid for by the consumer, these latter having hitherto been provided free by the Corporation.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £67 to £67 10s. (Last week, £67 15s. to £68.)

**Bankruptcies.**—The last day for receiving proofs in the bankruptcy of Charles Blake, trading as the Bilston Electrical Co., 4 Church Street, Bilston, is April 22nd. The trustee is Mr. S. W. Page, 80 Lichfield Street, Wolverhampton.

**Companies Struck off Register.**—The following have been struck off the register of joint stock companies:—Electricity Generating Co. and Ferabin Lamp & Electrical Accessories, Ltd.

**Liquidations.**—The Electromotor Equipment Co., 59 to 65 Paul Street, E.C., is to be wound up voluntarily. The liquidator is O. Steiner, 21 Old Broad Street, E.C.

## NEW COMPANIES

**CARLETON ELECTRICAL CO.,** 569, Garratt Lane, Earlsfield, Surrey. Capital £20,000. To take over the electrical business of G. Inrig, L. Inrig, and Gavan Inrig, Ltd. Private company.

**E.M.F. (1914).**—Capital £3,000. To take over the business of E.M.F., Ltd., at London and Walsall. (Private company.)

**LOMBARD, ROGERS & CROOKS.**—Contractors for public and private works, including electric light, &c. Capital £2,000. Private company. Registered by Jordan & Sons.

**"Undue Preference" under Electric Lighting Acts.**—An important action has been heard by Mr. Justice Sargant in the Chancery Division last week, in which the Attorney-General, at the relation of the Long Eaton Gas Co., raised the question as to whether the Long Eaton Urban District Council is within its rights under the Electric Lighting Acts in charging preferential rates to users of electrical energy for power purposes. This matter has long been the subject of controversy in various parts of the country, but it has never been contested in a court of law before, and consequently considerable interest will attach to the judgment in this case, which has been reserved. As a matter of fact, there are only two or three large power contracts running in Long Eaton, the Council's power tariff being one under which power users taking a supply for power and lighting, and using electricity only, are granted special terms. The argument is that this tariff is intended to attract customers for electric lighting to the detriment of the Gas Co., and as such is a preference far beyond anything contemplated by Sections 19 and 20 of the Electric Lighting Act of 1882.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 382 [VOL. X., No. 17]

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THURSDAY, APRIL 23, 1914.

[PRICE ONE PENNY.

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word minimum One Shilling, three insertions for the price of two.

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Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE Building Trades' Employers' Association in the Manchester district have agreed with the Electrical Trades Union to certain working rules for wiremen; while placing no obstacle to their men joining the Union, the masters do not agree to employ Union men only.—The refusal of the Electrical Trades Union to accept this principle in London has still been standing in the way of negotiations for settling the wiremen's dispute there, but as the building trades unions are apparently giving way on this point, a settlement may shortly be expected. The number of London wiremen on strike is still very small. (Page 224.)

THE War Office brought an action against an architect and their consulting engineers for negligence in permitting lead-covered wire to be used under plaster in one of the War Office buildings. The case concluded on Tuesday. Judgment is reserved. (Page 224.)

ABOUT 12,000 h.p. in motors is connected to the 44,000 volt three-phase duplicate transmission line across the Isthmus of Panama for working and lighting the Canal locks. The line is fed from a hydro-electric station at Gatun, and there are transformer substations at Cristobal and Balboa, where the pressure is reduced to 2,200 volts. The pressure is further reduced to 240 volts in 36 substations in the lock-walls for working the motors. The movements of all machinery are reproduced on an interlocked control board at the locks. (Page 225.)

SOME tests by Mr. F. J. Teago on a 12 kva. 200

volt transformer show that by the use of air-blast cooling with "fogged" air a large decrease in the temperature rise results. (Page 226.)

THE adjustment of crane brakes of the flapper type is dealt with in our Questions and Answers columns. (Page 227.)

A DESCRIPTION of a method employed for the repair of a broken down armature is contained in a Paper recently read before the Association of Mining Electrical Engineers. (Page 227.)

A DESCRIPTION appears in our Electric Traction Notes of an electric mountain railway in Japan. The recent interruption in the working of the Great Northern & City Railway on Thursday was due to a feeder breakdown. (Page 228.)

AN important wireless telegraph patent action is to be heard in June. (Page 228.)

A SPECIAL switch and fuse box has been designed for single-phase induction motor circuits in which a larger fuse is in circuit when starting than when running. Our Trade Section also contains illustrations of railway station and restaurant lighting. (Page 229.)

LOANS of £25,000 and £3,000 are to be taken up at Ayr and Walsall; a 12,000 kw. turbo-alternator is required at Leeds; cables at Southwark and Belfast; electric lighting schemes are under consideration at Flint, Keith, Braintree, Guisborough, and Inverurie; four electric cranes are required at Cadiz. (Page 231.)

AFTER considerable negotiations, arrangements for a bulk supply have been made between the St. Anne's and Lytham Councils.—A site for a new power station has been selected at Edinburgh.—Considerable additions are to be made to the public electric lighting at Dover.—A supply of electricity is given for the first time in Macclesfield.

A NET profit of £8,782 is reported for 1913 by Willans & Robinson after meeting debenture interest.—The satisfactory position of the Brush Electrical Engineering Co. was commented upon at the annual meeting on Monday, as was also the fact that the Ljungstrom turbine supplied to the North Metropolitan Electric Power Supply Co. has been taken over.—A satisfactory year is also reported by Johnson & Phillips. (Page 232.)

THE "four sevens" Marconi Patent expires during the current week.—A Patent by S. G. Brown relating to quadruplex submarine telegraphy also expires after a full life.—Opposition to the Grant of a Patent to the British Thomson-Houston Co. for tungsten suitable for drawing into filaments is opposed by Brinsdown Lamp Works. The Patent for spiders for tungsten incandescent lamps applied for by Wolfram Lampen A.-G. has been allowed by the Comptroller in spite of the opposition.—The specifications published by the Patent Office last week include two relating to wireless and two relating to dynamo design. (Page 233.)



## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, APRIL 23RD.

*Institution of Electrical Engineers.*

8 p.m. "Electrification of Railways as Affected by Traffic Considerations," by H. W. Firth.

FRIDAY, APRIL 24TH.

*Institution of Mechanical Engineers.*

8 p.m. "Application of Electric Driving to Existing Rolling Mills," by L. Rothera.

SATURDAY, APRIL 25TH.

*Association of Mining Electrical Engineers.*

5 p.m. Warwickshire and S. Staffs Branch. At Imperial Hotel, Birmingham. (1) "Notes on Fault Testing," by E. E. Beadmore. (2) "Some Hints for Colliery Electrical Plant," by J. A. Kerr.

6.30 p.m. S. Wales Branch. At Carlton Café, Queen Street, Cardiff. "Automatic Controllers for Mining Work and Some Hints for Colliery Electrical Plant," by J. A. Kerr.

MONDAY, APRIL 27TH.

*Institution of Electrical Engineers: Newcastle Students' Section.*

7.30 p.m. At Armstrong College. "Electric Ship Lighting," by B. S. Orme.

TUESDAY, APRIL 28TH.

*Royal Society of Arts.*

4.30 p.m. Colonial Section. "The Administration of Imperial Telegraphs," by Charles Bright.

*Institution of Electrical Engineers: Manchester Section.*

7.30 p.m. Annual General Meeting at the University, followed by lecture by Prof. J. A. Fleming, F.R.S.

*Institution of Civil Engineers.*

8 p.m. Annual General Meeting.

WEDNESDAY, APRIL 29TH.

*Electrical Contractors' Association.*

6.30 for 7 p.m. Annual dinner at Grand Hotel, Leicester.

*Institution of Electrical Engineers: Students' Section.*

7.45 p.m. Annual meeting at Victoria Embankment, followed by discussion on "The Students' Section."

### The London Electrical Engineers.

Headquarters (46 Regency Street, S.W.) open Sats. till noon.  
Rating Exam. for all Cos. from 7 to 10 p.m. every Wednesday.  
(To-day) THURSDAY, APRIL 23RD, C. Co. FRIDAY, APRIL 24TH, D. Co.

## WIREMEN'S WAGES

NEGOTIATIONS between the Manchester, Salford & District Building Trades Employers' Association and the Electrical Trades Union for a revised code of working rules for wiremen and cable-jointers have resulted in an amicable settlement.

The most important of these rules, which have been mutually accepted, is as follows:—"Whilst agreeing not to place any obstacle in the way of men joining the Union, employers do not agree to employ Union men only."

The other rules are summarised below:—

The minimum rate of wages for qualified wiremen and cable-jointers is to be 9½d. an hour, which it may be mentioned is the rate which came into operation at the termination of the strike last November. The extra pay for charge-hands is to be mutually agreed in each instance. These wages are for a 52-hours week (9½ hours ordinary days and 4½ Saturdays); time and a quarter overtime for first two hours; time and a half for the second two hours, and then double time. Ordinary night gangs to be paid time and a quarter from 6 p.m. to 6 a.m.

Beyond a radius of one mile from the Manchester Town Hall, the following will be paid as travelling expenses: up to 2 miles, 3d. per day; 3 miles, 5d. per day; 4 miles, 8d. per day; 5 miles, 10d. per day, and time is to start on the job. At greater distances ordinary railway fares are allowed, and travelling time is paid each way. If required to lodge away from home 1s. 6d. a night is allowed, and return railway fares every fortnight within 20 miles; every month within 50 miles; and every three months over. Travelling outside ordinary hours for breakdowns, &c., is paid for at time and a quarter.

The number of apprentices is to be limited to one-third the average number of journeymen employed, averaged for the past three years.

Each qualified workman to have a full kit of tools, comprising cutting and gas pliers, heavy and light hammers, 2 gimlets, ratchet brace with 4 snail and 2 twist bits, 2 ft. rule, 4 firmer and 2 plugging chisels, tenon and key-hole saws, 2 lb. soldering iron, half-round file, 3 screwdrivers, 2 bradawls, square, plumb line, small plane, gouge, and small footprint.

Extra payment for "dirty work" to be as follows:—Cleaning out or repairing old accumulators, and work in oil vessels after carrying oil, 1s. per day; other ship repairs, mines and pits, 6d. per day; chemical works, accumulator works, paint works, riverside premises and docks, where conditions are abnormal, 6d. per day.

There is to be no strike or lock-out until any matter in dispute has been referred to a joint committee of employers and operatives who shall meet within six days; failing agreement, it shall be referred to an umpire, and wherever practicable, current conditions are to prevail in the meantime.

A qualified wireman and cable-jointer is defined as being over 21, and either having indentures of apprenticeship or references proving 5 years' employment in general electric contracting work; or alternatively, he must produce a certificate from some recognised authority.

No alteration is to be made in these rules without giving six months' notice, to expire on May 1st in any year.

There are still a few electrical wiremen out on strike in London, and there has been practically no change in the position during the past fortnight. The Union seems anxious to meet the masters to discuss the points of difference, but wish to eliminate from the discussion the so-called "Disability Clause," which they refuse to accept in principle. To this stipulation the masters will not agree; they regard it as an essential condition that Union men shall work amicably with any non-Union men who may be employed on the same job. In view of the probable settlement of the building dispute, and the acceptance by the building trades unions of the rule that trade unionists and non-union men shall work together as before, it appears likely that the wiremen will now abandon their attitude towards the disability clause, and the only outstanding point in dispute should now be as to the new grade of "pipe-fitters."

## LEAD-COVERED WIRE UNDER PLASTER

### Liability of Consulting Engineers

A CASE which has occupied several days in the King's Bench Court and terminated on Tuesday, has introduced two important questions, namely, the liability of consulting engineers for "negligence" if work has been done unsatisfactorily, and also whether it is desirable to bury lead-covered wire under plaster when wiring new buildings. The case in question is an action for negligence brought by the War Office against an architect, Mr. J. H. T. Woodd, and the consulting engineers, Messrs. Kirkland & Capper, for damages due to their alleged negligence in connection with the wiring of the Medical Staff College and Laboratories at Millbank, Westminster, in 1905.

It appears that the consulting engineers were instructed to follow a standard War Office specification, so far as this was applicable; a clause in this was to the effect that all conductors should be accessible to authorised persons, and another specified I.E.E. rules. The 1903 Code of Institution Rules was then in force, one of which specified that conductors buried in cement and plaster must be provided with protection of sufficient strength to resist a nail. For the walls of the building a material known as "Frazzi" slabs was employed, which is troublesome to chase, and only about ½ in. of plaster covered these blocks. After consultation with the architect, Messrs. Kirkland & Capper instructed the wiring contractors, Messrs. John Bolding & Sons, to employ twin lead-covered, rubber-insulated wire between the slabs and the plaster. A year or two after the job had been taken over, trouble was experienced, which the War Office experts allege to have been due to the wire having been damaged on rough corners of walls, &c., in laying, and also to electrolytic action due to the damp plaster; they pointed out also that the connection boxes for the wire were not watertight, and generally contend that the work was badly done, and in contravention of the War Office specification. The building, which included 879 points, was subsequently re-wired by another contractor.

For the defence it was alleged that the faults were due to rough work done by men of the Royal Engineers in executing repairs and extensions, that fuses had been replaced by copper wires, and it was suggested that there were faults in flexibles which caused over-heating of the buried conductors. Mr. Kirkland also maintained that accessibility to authorised persons in the War Office specification could be taken to apply to the ends of the conductors only, and that he considered it sufficient protection if he placed the conductors in positions where nails would not be likely to be driven in. Great care had been taken in putting in the wires and in testing. He had used lead-covered wire buried in plaster at Guy's Hospital since 1900, and there were now 30 miles of such wire there.

The Solicitor-General led the case for the War Office, and Mr. Shearman, K.C., and Mr. A. J. Walter, K.C., were leading counsel for the defence. Mr. Justice A. T. Lawrence has reserved judgment.

## ELECTRIC WORKING OF THE PANAMA CANAL LOCKS

SOME particulars are now available of the electrical equipment supplied by the American General Electric Co. for the working of the locks and for the lighting of the Panama Canal. The course of the canal, position of the locks and generating stations can be seen in the sketch map, Fig. 1. The main generating station is situated at Gatun, where there is a 7,500-kw. 2,200-volt three-phase hydro-electric plant. There is also a 4,500-kw. steam turbine plant at Miraflores, which was used to supply the electrical energy used during the construction of the canal, which can be used to give an emergency supply. The pressure is stepped up to 44,000 volts for transmission, and the lines, which are of seven strand copper, are run in duplicate across the Isthmus so as to connect the two generating stations with Cristobal and Balboa through four transformer substations. In addition, there are some thirty-six substations in the lock walls, transforming from 2,200 volts to 240 volts, and supplying Gatun, Pedro Miguel and Miraflores locks for power, traction, and lighting. The transmission line itself, which is in duplicate, is erected on steel side brackets fixed to steel lattice gantries spanning the railway track, so that when it is decided to electrify the railway the trolley wire can be suspended from these gantries, which have a solid concrete foundation, and are about 300 ft. apart. The lines are fixed 5 ft. apart horizontally, and 5 ft. 6 in. from the frame. Three-part porcelain suspension insulators, 10 in. in diameter, with fillings of Monel metal to

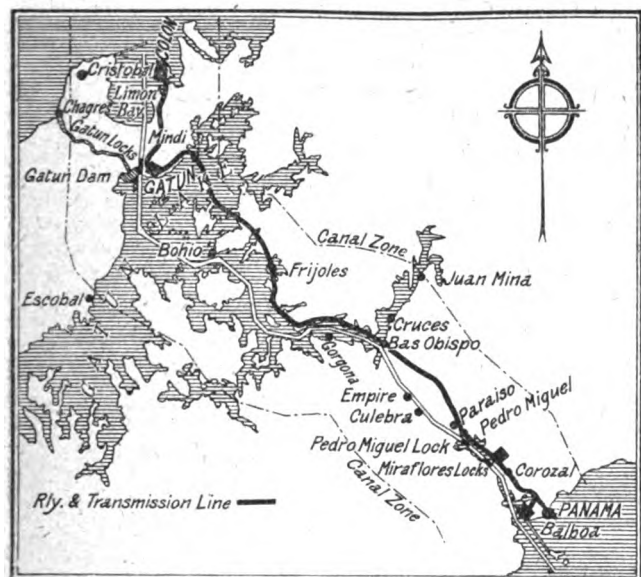


FIG. 1.—ROUTE OF RAILWAY AND TRANSMISSION LINES, SHOWING POSITION OF THE PANAMA CANAL LOCKS, GENERATING STATIONS, AND SUB-STATIONS.

resist corrosion due to the humid atmosphere, are used. At the top of each side frame is erected a continuous 5/16 in. copper-clad solid wire with amalgamated steel core. This wire is earthed at each of the 917 gantries. The total length of the transmission line is nearly forty-eight miles. About 4,000 suspension and 2,500 strain insulators are used. The scheme of connections necessitates throughout duplicate bus-bars and switches, so that any oil-switch can be disconnected for cleaning or repairs without interrupting its circuits. Each of the transformer substations contains duplicate 200-k.v.a. transformers and one single-phase 25-k.v.a. transformer, giving 220 and 110 volts for lighting. These substations are normally fed from the 2,200-volt bus-bars in the main 44,000/2,200-volt substations, but can also be run direct from the generating stations if necessary.

In the Gatun generating station and the four 44,000-2,200-volt substations, the oil-switches are controlled through solenoids, and are installed in concrete cells, above which are concrete fireproof compartments containing the two sets of bus-bars. In the thirty-six transformer stations in the lock walls, the oil-switches are worked by hand. All the 2,200-volt oil-switches (Fig. 2) have disconnecting switches, so arranged that live parts are completely covered. For the hand-worked switches a pipe framework supports vertical metal guides which carry the oil-switch mechanism and slate base, forming a section of the switchboard panel. On the guides a lever and

toggle mechanism is mounted, by which the oil-switch and slate base may be raised and lowered. Above the oil-switch, mounted on the pipe framework, a stationary cast-iron base carries the disconnecting switch-studs and insulators. The high-pressure leads run to the tops of the disconnecting switch-studs, and the bottom of each stud is equipped with contact fingers. On the top of each oil-switch stud is mounted a contact blade. When the oil-switch is raised, these blades engage the contacts on the bottom of the disconnecting switch-studs, which thus, in the closed position, form extensions of the oil-switch studs. The disconnecting switch contacts are surrounded by insulating shields, which prevent accidental contact. When the oil-switch is lowered, it is completely isolated from the circuit, and when raised, it always goes to

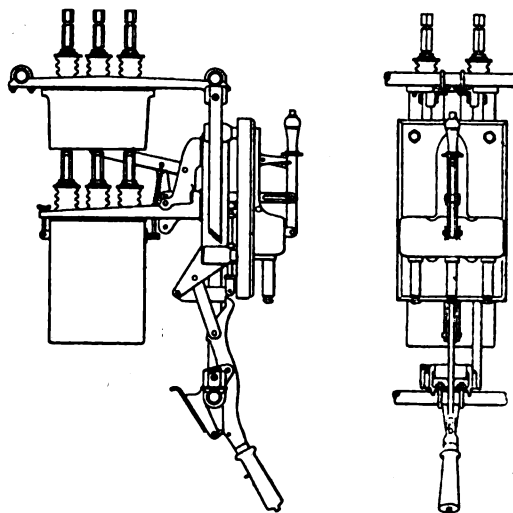


FIG. 2.—ARRANGEMENT OF OIL SWITCHES.

a fixed height, where it is latched. An interlock prevents it from being raised or lowered unless its contacts are open, precluding the circuit being closed or opened by the disconnecting switch. In some instances another interlock makes two single-throw switches a double-throw switch, and prevents both switches being closed at the same time. For the solenoid-operated switches, the same form of disconnecting switch is used; but the solenoid is stationary, and the connecting mechanism to the oil-switch has a vertical slotted link which allows the switch to be raised and lowered without being disconnected from the solenoid mechanism. A mechanical interlock prevents the raising or lowering of an oil-switch while in the closed position.

The size and disposition of the motors used for the control of the locks are shown by the following table:—

Machines	Motor Hp	Number of Motors				Total Hp
		Gatun	Pedro Miguel	Miraflores	Total	
Mitre gate, moving, each leaf ... ..	25	40	24	28	92	2,300
Mitre gate, mitre forcing	7	20	12	14	46	322
Fender chain, main pump ... ..	70	16	16	16	48	3,360
Fender chain, operating valve ... ..	0.5	16	16	16	48	24
Rising stem gate valve	40	56	24	36	116	4,640
Cylindrical valve ... ..	7	60	20	40	120	840
Guard valve ... ..	25	6	6	6	18	450
Auxiliary culvert valve	7	4	4	4	12	84
Totals ... ..	...	218	122	160	500	12,020

Most of the motors are controlled through contactor panels operated from the central control station. The smaller motors are started by being thrown direct on the line, while in the case of the larger motors a starting step, having resistance in two legs of the three-phase circuit, is provided. Local control is also provided for. The mitreing gates consist of two massive

leaves pivoted on the lock walls and working independently. In addition, at the lake and sea ends duplicate gates are provided. Also, intermediate mitreing gates divide each 1,000-ft. lock into two compartments, so that vessels of different sizes can be conveniently handled. When the mitreing gates are closed they are clamped by a "mitre-forcing" machine. For the control of the water-level there are three culverts fitted with rising stem valves. These valves are 8 ft. by 18 ft., and are installed in pairs, each pair in duplicate. Since the culvert in the middle wall has to serve the locks on both sides, cylindrical valves are placed in the lateral culverts at each lock. Where the guard gates are provided, two auxiliary valves are used to regulate the water to an intermediate height.

The indicators on the control boards (Fig. 3) are designed to show accurately and synchronously every movement. Both transmitter and receiver have a stationary and a rotating part. The stators have three-phase windings, and are connected together. The rotors have two poles, and are fed in parallel with 100-volt 25-cycle single-phase current. In the case of the mitreing gates the indicator is provided with a pair of small aluminium leaves. For the chain fender the indicator transmitter is driven by the limit switch shaft, and the indication at the board is given by a miniature aluminium chain with its ends fastened to semaphore arms. The indicators for the valves consist of aluminium cages. The under portion of each shaft is illuminated. The water-level indicators have an accuracy within 0.1 per cent. or 0.05 ft. of actual water-level. There are two sets of transmitters and receivers, one connected to a fine index in which the rotors make ten complete revolutions, and

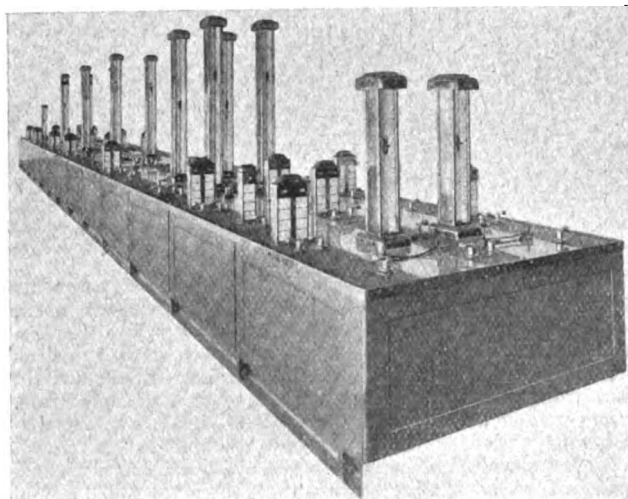


FIG. 3.—CONTROL BOARD FOR MIRAFLORES LOCKS.

the other connected to a coarse index working through less than 180°. The fine index is a hollow cylinder carrying a pointer, the length of the cylinder being such that when the aluminium ball representing the coarse index is within the limits of the cylinder the reading of the fine index is correct within the limits specified. For water-level indication, wells 36 in. square, moulded in the lock walls, communicate with the locks by small openings which serve to damp any surges. Each well contains a welded-steel box float, 30 in. square by 9 in. deep. A non-slipping phosphor bronze belt transmits the movement of the float to a sheave on the transmitter mechanism. Each mitre-forcing machine has its open and closed positions shown by red and green lamps and a mechanical indicator. The control boards themselves are of the flat-top desk type, 32 in. high by 54 in. wide, and the lengths are 36 ft. at Pedro, 52 ft. at Miraflores, and 64 ft. at Gatun. The switch handles work through 90°, and are just above the board, while just below are the contact fingers and synchronous receivers. The control circuits are worked with 220-volt 25-cycle single-phase current. The switches are all interlocked, so that flooding in wet weather and waste of water in dry weather are avoided. These interlocks, of the bell crank and rod type, are arranged in two vertical racks below the control board, so that they can be inspected from a lower floor. All small parts of the equipment have been made of brass, copper, Monel metal, bronze or sheradised iron or steel. Mica and impregnated asbestos have been used largely in place of fibre or wood, owing to the humid atmosphere. The combined weight of the control boards is about 39 tons.

## AIR-BLAST COOLED TRANSFORMERS

A PAPER summarising the results of some tests on a 12-k.v.a. 200-volt 50-cycle 1:1 ratio transformer was read by Mr. F. J. Teago before the Manchester Section of the Institution of Electrical Engineers on March 24th. The meeting was held at the Liverpool University, and a demonstration of the apparatus used in the tests was made. Particulars of the transformer used in the tests are as follows:—

**Core.**—Rectangular; net cross-sectional area, 7.75 sq. in.; maximum flux density, 80,000 lines per sq. in.; plates, 0.02 in. stalloy; one ventilating duct, 0.407 in. wide; net weight of iron, 82 lb. **Coils.**—Sandwiched; six primary coils, each of twenty-four turns of strip 0.63 in. by 0.0472 in.; four secondary coils, each of thirty-six turns of strip 0.944 in. by 0.02955 in.; current density, 2,200 amperes per sq. in.; net weight of copper, 48 lb.; estimated amount of air, for mean coil rise of 50° C., with inlet air at 15°–20° C., equals 5 cub. ft. per sec. The transformer had a sheet-iron case, and the air was discharged outside the building. The air was forced along a baffled pipe 7.7 in. internal diameter, and measurements were made by means of a Brabbé tube and differential manometer. The first set of experiments was made to find out whether the varying humidity of the air had any effect on its cooling properties. The result was negative. Four thermo-couples were used for the temperature measurements—one in the duct near the iron and the inside surface; one in the duct near the iron and the top outside surface; one in the space between the middle primary and lower secondary coil, in about the centre of the limb face; and another in the same space and up against the wooden strip covering the corner of the iron. Since the latter was largely protected from the cooling effect of the air on account of the wooden strip, it was thought likely that the surface rise of temperature of the coils was a maximum at that point. It was found that the surface temperature rise of the coils at that place was equal to the mean, as determined by resistance measurements. A number of tests were made with air rendered "fogged" by atomised water. In one series of tests, 436 grammes of water per hour were used, and in another 914 grammes per hour. These quantities were expected to decrease the temperature rise by 33 and 66 per cent. respectively. It was found that the first thermo-couple showed a greater decrease, the second a less, and the third a decrease approximately equal to that anticipated. No injury was done to the insulation by the water. The insulation resistance was low immediately after a test, but this was due to condensation on the bare ends of the windings. When these were dried the normal insulation resistance of 10 megohms was obtained. Better atomisers can be obtained than were used in the tests, so that better results should be obtainable. By varying the quantity of ordinary cooling air over a number of tests it was found that, from any particular value of total watts loss, cub. ft. of air per sec. × mean rise of temperature of coil = constant. Hence, by determining two values the others can be deduced. In the transformer tested at 8 k.v.a. no air was found to be necessary, and for 20 k.v.a. 9 cub. ft. per sec. was necessary. Experiments on a similar transformer, only with no air duct, but with a chambered core, are in progress.

**Recording Pyrometers.**—A Paper by Prof. C. R. Darling read before the Faraday Society yesterday described several patterns of recording pyrometers. For research purposes and for accurate work under steady conditions where the temperatures do not exceed 1,000° C., the resistance pyrometer was stated to be the best, but for conditions prevailing in industrial work the thermoelectric pyrometer was usually more suitable. Above 1,200° C. radiation pyrometers were generally used, recording by thermoelectric means. A number of instruments for making automatic continuous records on paper charts were described, in many of which the pointer is normally free to swing without touching the paper, but is periodically caused to make a mark. The Callender and other recording resistance pyrometers were also described, and reference was made to photographic recording methods and semi-automatic methods, in which the observer follows the motion of a spot of light.

**The San Francisco Engineering Congress.**—Arrangements are advancing for the Engineering Congress to be held at San Francisco in 1915, and applications for enrolment have already been received from 42 countries. Among the ten sections into which the congress is to be divided, one will deal with electrical and mechanical engineering. Full information can be obtained from the Committee of Management of the International Engineering Congress, 1915, Foxcroft Building, San Francisco, Cal., U.S.A.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,388.

An earth indicator is connected up as in Fig. 1 on a three-phase star-connected system supplied through a transformer as

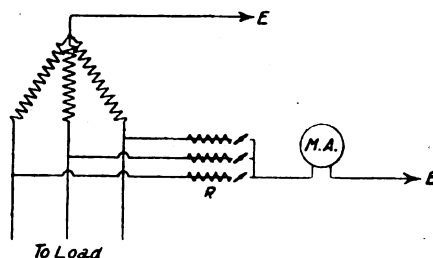


FIG. 1.

shown. What is the mistake? How ought the instrument to be connected? Explain its uses and action.—SPARK.

(Replies must be received not later than first post, Thursday, April 30th.)

### ANSWERS TO No. 1,386.

With an electric crane brake of Laurence Scott's flapper type, trouble is experienced by wearing of the wooden blocks owing to the load being too light to attract the flapper. The motor is rated at 22 h.p. at 600 r.p.m. The crane is designed for 20 tons, but is used for an average load of about three tons. Can any remedy be given for the trouble, which cannot be got rid of by adjustment of the springs.—POTENTIOMETER.

The first award (10s.) is given to "L. B." for the following reply:—

The trouble encountered with this special form of brake magnet can easily and cheaply be remedied by arranging to insert some resistance in parallel with the motor armature on the first starting notch of the controller, in addition to the usual series resistance. This obviously can be adjusted so that the series field will attain the required strength to operate the brake, while allowing only sufficient current to armature to obtain the torque required. On the second notch of controller this parallel resistance should be cut out, as the brake flappers once attracted will hold with very low loads; with the first step of series resistance or independently as may be most convenient to arrange. This parallel resistance feature, correctly designed, gives also an additional safeguard, as at starting positive control over the hoisting and lowering is obtained. For full information as to technical data see answer to Question 1,286 (ELECTRICAL ENGINEERING, Vol. VIII., p. 279, May 23rd, 1912).

In the unlikely event of the brake flappers releasing after cutting out this parallel resistance, the following may be resorted to:—Adjust the springs until the brake will hold when attracted. Utilise a lower speed than at present when running, i.e., always run with some series resistance in circuit and resistance in parallel with armature. This is, however, wasteful in current consumption. Rewind the field coils to

suit the average load, diverting part of the current when the crane is required for large load.

The second award (10s.) is made to "M. M.," who writes as follows:—Before making any extra fittings be sure that the brake is in correct adjustment. All the joints should work easily, but without any "idle" motion. The springs must be set so that they will just have sufficient tension; anything beyond this will require a proportionately stronger pull on the part of the flappers, FF (Fig. 2). Failing this, it might be possible to shorten distance between the fulcrum, O, and the brake blocks; it should not be very difficult to fasten a second fulcrum to those already in position. Improvements might also be effected on the flappers; for

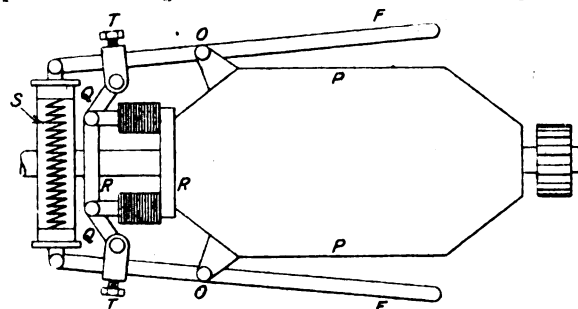


FIG. 2.

the greatest effort they should be set so that greater number of magnetic lines pass between pole and flapper at maximum distance from O. As a last resource an arrangement as indicated by the accompanying diagram is suggested; with this there should be no difficulty in relieving the brake. RR are two iron rings which form yoke and armature of a solenoid respectively; one is fastened to frame of motor, and carries two coils; to the other is attached the plungers and two toggle links, QQ. These toggle links engage with flapper levers by means of the movable pieces, TT, this affording a convenient method of adjustment. Solenoid coils can be joined up in the magnet circuit, and with very little expenditure of energy will give extra brake relieving effort as may be required.

## AN ARMATURE REPAIR

A PAPER entitled, "Breakdown of a D.C. Motor Armature," by Mr. F. Church, was read before the Midland Branch meeting of the Association of Mining Electrical Engineers at Nottingham recently, and will be discussed at the Warwickshire and Staffordshire and Yorkshire Branches. The breakdown in question was due to copper and carbon dust from the commutator and brushes collecting behind the commutator lugs, and being retained by the insulating lacquer which was softened by the heat. A conducting path was thus formed between the commutator segments and the armature spider. It was found possible to repair the armature without removing the commutator by unsweating these groups of lugs, which gave sufficient access to scrape out the conducting mixture of lacquer and dust. The armature was then dried out by heating electrically by means of resistance wires wound round it, and while hot the exposed portion of the commutator sleeve was well coated with air-drying lacquer. Afterwards a single layer of cotton tape was wound round the sleeve. The lacquer was applied to the back of the commutator segments in a thin layer and allowed to dry. When thoroughly dry, the whole of the interior was given a second coating of "Votalac." When this was dry, a layer of brown paper was laid over the lacquered parts, and then the conductors were re-sweated into their respective lugs, care being taken to have the conductors and lug to be sweated in such a position that the solder ran away from, and not into, the interior of the armature. The cord binder was then placed in position and the temperature of the armature raised to 100° F.

To prevent this kind of failure, continues the author, the space between the commutator lugs must be filled in so as to make it impossible for the copper and carbon dust to pass through. The only way to prevent this class of fault effectually is to have the commutator segment and lug made in one piece, and the mica extended to the top. With armatures up to 20 h.p., the lugs can be made short and the ends of the conductors laid obliquely from the lugs to the slots. Impregnated tape should be laid beneath the conductors to prevent any dust passing between them to the back of the commutator.



### ELECTRIC TRACTION NOTES

Some details of the locomotives for the Usui-Toge (Japan) rack railway (*ELECTRICAL ENGINEERING*, March 19th, p. 159) are contained in the March issue of the *A.E.G. Journal*. There are three adhesion driving wheels, which each take about one-third of the total weight of 42 tons. There are two motors, each of 350 h.p. at 650 r.p.m. on the hourly rating. One is used for the adhesion and the other for the rack drive. In the former case the motor is rigidly mounted in the spring-supported main frame. It works with a gear ratio of 1:6.4 on to the gearing shaft, and from here on to the jack shaft, also rigidly supported in the framework, from which the driving wheels are driven by coupling rods. The two pinions are mounted on two axles in the fixed inner frame; the pressure of the gearing teeth is here taken up by the movement of the springs. The inner frame also carries the rack motor. This is spring-suspended at one end from the outer frame, however, in order to keep the dead weight of the unsprung masses as low as possible. It is mounted on a cast-steel bracket which can turn, and works on to the gearing similarly to the adhesion motor, but the ratio is 1:5.9. From here a driving rod works on to a pinion axle. Both axles are connected by coupling rods, and, as in the adhesion drive, the cranks are set at an angle of 90°. There is a friction coupling between the rotor shaft and pinion which slips when a certain torque is exceeded. The control is through contactors contained in asbestos-lined compartments along the sides of the locomotive. The control current is obtained from forty secondary cells. The controller has three drums, the extra one being on account of the rack. The rack motor normally runs at no-load, and synchronism between the two motors is obtained by connecting the field of the rack motor in series with the field and armature of the adhesion motor, both armatures being in parallel. On the rack sections the usual series-parallel control is adopted. At the maximum series and maximum parallel positions of the controller the fields are shunted. A short-circuit brake, which is always used when travelling on the down gradient, is provided. The armature of one motor is connected in series with the field of the other and with the resistances used for starting. This crossed brake connection makes the brake act with certainty whether the position of the reversing controller corresponds to the direction of rotation of the motors or not. In the event of the current failing in the third rail while the train is travelling upwards, the driver only has to remember that the grouping drum must be placed on the position "brake" before the braking can be carried out at the main drum. The locomotives can pull a train of 90 tons, or when two are used, as is usual on a train of 180 tons, up a gradient of 6.7 per cent. at about 10 m.p.h.

It is stated that a Company known as La Société Anonyme des Tramways Eclairage et Force Electrique de Bagdad has been formed by the National Electric Construction Co., for the construction and working of tramways, and also for giving a supply of electricity in Bagdad. The concession provides for a lease of seventy years, and the municipality is to participate in profits after the first twenty years.

It is stated that the electric train service on the London & North Western Railway between Willesden and Earl's Court will commence on May 1st.

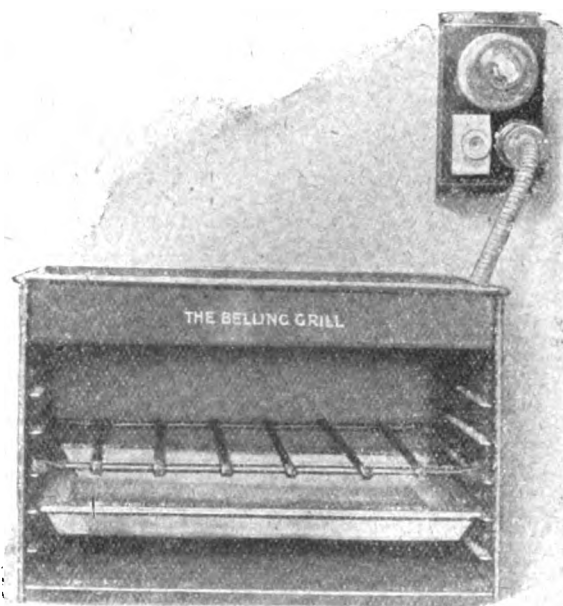
Last Thursday evening the service on the Great Northern & City Railway was suspended for about three hours, due to a burn-out on a 0.8 sq. in. 600-volt feeder in the tunnel.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The patent infringement action between Marconi's Wireless Telegraph Co. and the Helsby Wireless Telegraph Co., which has been on Mr. Joyce's list for several sittings, has now been transferred to Mr. Justice Eve's list. Prof. Bertram Hopkinson has been appointed assessor to sit with the judge, and the action is expected to commence on June 23rd.

The French Administration notifies the opening of offices at Benguerir, Benhamed, Berrechio, Boucheron, Boulhaut, Bouznika, Darbelhamri, Guicer, Hadjeb, Maaziz, Marchand, Mechrabelksiri, Mechrabenabbou, Monod, Ukrelia, and Tiflet in Morocco, and messages must be routed *via* Tangier.—The Cayenne-Salinas cable of the French Co. is in working order.

## BELLING ELECTRIC GRILLER and TOASTER.



**A large strong griller for kitchen work complete with close mesh grid and drip pan.**

**READY for USE**

**in less than one minute.**

**VERY SIMPLE CONSTRUCTION.  
DOES ITS WORK PERFECTLY.**

**Actual cooking space  
15½ ins. long by 7¾ ins. high  
by 11¼ ins. deep.**

Griller with elements (7 bars) and terminals 42/- Subject.  
Griller do. with 1 yard flex met. Tube & Plug 49/6    "  
Griller do. do. and control panel as illustrated 65/9    "

**BELLING & CO.,**

**Electric Heating & Cooking Specialists,  
Edmonton, . . . LONDON, N.**

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 231. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**HEATING AND COOKING APPARATUS.**—A new catalogue from Ferranti, Ltd. (Central House, Kingsway, W.C.), in the form of a number of leaflets conveniently arranged in a cover, deals with the latest patterns of electric heating and cooking apparatus manufactured by the firm. The basis of most of this apparatus is a disc type element. This is covered with a quartz plate in their "electric fires," which are listed in numerous varieties, and in an iron case, forms a cooking element which can be mounted as a single boiling plate in various styles. The grills, however, have a different type of element of open wire in fire-clay mounting, and several combinations of boiling plates and grills are made. The disc element is used in the ovens, and these again can be combined with grills and boiling plates. The whole range of apparatus appears substantial and well made, and the interchangeability of parts is a great recommendation.

**DRY CELLS.**—A new catalogue embracing Siemens-Obach dry cells, ignition coils, leather cases for dry cells, Hellesen dry cells, Dura cells, and Siemens transport cells has just been sent us by Siemens Bros. & Co., Ltd. (Woolwich, S.E.). The Siemens-Obach dry cell is made in a very large number of sizes suitable for many kinds of work. Each cell gives about 1.5 or 1.6 volts, and this has been found to fail by only some 4½ per cent. after 33 months' storage, and at the same time the increase in internal resistance was not great. The Hellesen dry cell is also made in a number of sizes, and can be used for similar purposes to the Siemens-Obach. The exciting agent of the Dura cells is in a dry and inactive condition when they leave the works, and thus can be stored without deterioration. The addition of water makes them ready for use.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**SIGNS.**—In the latest catalogue of electric signs for advertising issued by the Sun Electrical Co., Ltd. (118 and 120 Charing Cross Road, W.C.), are illustrations of a large number of popular designs, and also of signs specially designed for particular businesses. Many of these, we learn, have been recently supplied to large advertisers. Programme indicators and accessories for music halls and cinemas are also dealt with. Some of the signs are very artistic, and not a few are particularly novel and effective, and as the Sun Co. has specialised for a long time in this branch of electrical engineering, those interested in signs cannot fail, after a perusal of this comprehensive publication, to appreciate to what a fine art the business has come.

**BITUMEN AND JOINT-BOX COMPOUNDS.**—We have received from the Dussek Bitumen Co. (Canal Bank, Deptford, S.E.) a pamphlet dealing with the manufacture of Trinidite joint-box compound, which points out the features that should be present in satisfactory compounds for the purpose, and explains how certain tests commonly applied are misleading in their results. A further booklet indicates how widely this compound is used and appreciated. Very satisfactory tests of this joint-box compound have been made by the National Physical Laboratory, at the request of the Admiralty, and at Faraday House.

**FANS.**—A neat folder from the Edison & Swan United Electric Light Co., Ltd., deals with electric fans, and can be overprinted with names of contractors.

**INDUCTION MOTORS, &c.**—The Langdon-Davies Motor Co. (110 Cannon Street, E.C.) has issued new catalogues of single, two- and three-phase induction motors of the squirrel-cage and slip-ring types in various forms. Another list deals with Megger testing sets.

**BRAKE AND CLUTCH LINING.**—A pamphlet from the Herbert Frood Co., Ltd. (Sovereign Mills, Chapel-en-le-Frith), contains some results of tests of the well-known "Ferodo" materials for lining clutches and brakes made recently at the National Physical Laboratory, showing remarkable constancy of the coefficient of friction, excellent heat resisting quality, and very small wear.

**FUSES.**—A revised edition is to hand from Turners & Manville, Ltd. (Hopetown House, Lloyd's Avenue, E.C.), of their catalogue of "Noark" fuses, which in their latest improved forms are listed in a large number of sizes for potentials up to 22,000 volts, complete with various accessories, fittings, &c.

### FUSES FOR SQUIRREL-CAGE MOTORS

IN protecting squirrel-cage motors in the ordinary course there is some difficulty in deciding on the rating of the fuses. These motors naturally take a much larger starting current than running current, and if a fair margin is left over the starting current in deciding the size of the fuse, the fuse will be too big to protect the motor adequately against prolonged overloads during running. To overcome this, the Kartret Engineering Co. (Queen Anne's Chambers, Westminster, S.W.), in conjunction with Mr. E. Farndon (Sales Manager,

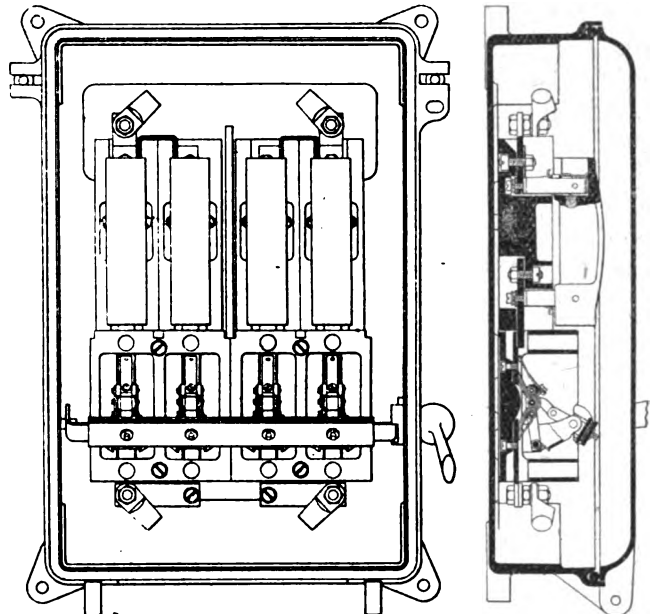


FIG. 1.—ELEVATION AND SECTION OF "TWO-RATE" SWITCHES AND FUSES.

West Ham Corporation Electric Supply), have patented a "two-rate" switch and fuse, which is now being placed on the market. On each pole there are two fuses and switches, one for the starting current and one for the running current. In starting the motor, the handle is lifted and both pair of switches are closed simultaneously, so that the two fuses are in parallel. As soon as the motor has attained running speed, the operator removes his hand and the starting switch

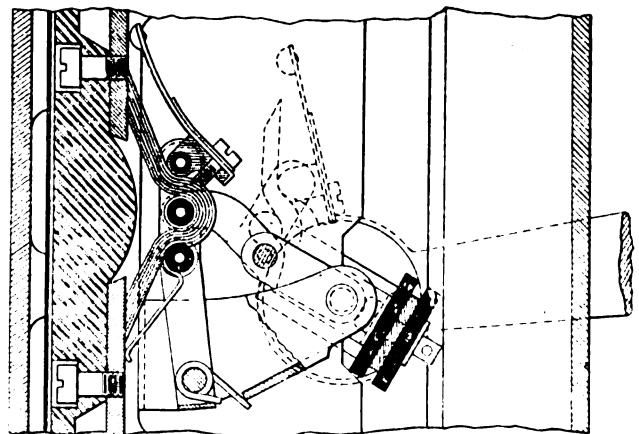


FIG. 2.—SECTION OF "KARTRET" SWITCH.

opens automatically, but the running switch remains in. The whole arrangement is extremely simple and effective. Fig. 3 is a photographic view of a two-pole single-phase switch and fuse-box, and also shows that there is a difference between fuse-holders for the starting and running positions, so that the two are non-interchangeable. Fig. 1 is an elevation and section of a similar set of switches and fuses, and Fig. 2 is

**"Prana" Lattice Armouring**  
in steel, copper, brass or phosphor-bronze.

☐ For the protection of Rubber Hose, Flexible Tubing, Cables, &c., &c.  
☐ Neat in appearance, extremely flexible, rust-resisting.  
☐ Low cost.  
☐ Especially adapted to the protection of "Sud" connections.

**"Prana" Die Castings**  
are ready for assembling.  
☐ The dies in which they are cast are virtually a gauge, so that further examination is unnecessary.  
☐ They cannot vary.  
☐ Made from alloys of guaranteed soundness.  
☐ British owned and made—"Tough and True."  
*Let us send you particulars and samples.*

**"PRANA" DIE CASTINGS.**

AERATORS LTD. (INCORPORATED) UPPER EDMONTON, LONDON, N.

a section of the Kartret switch which is employed. The apparatus is made in sizes for 10, 15, 25, 50, 75, 100, and

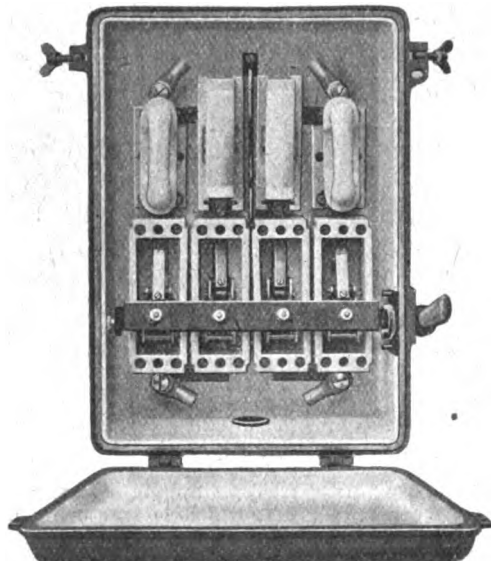


FIG. 3.—"TWO-RATE" FUSES AND SWITCHES.

150 amperes running current, the rating of the starting current side being for a maximum of three times these values.

### ELECTRIC LIGHT SWITCHING COMPETITION

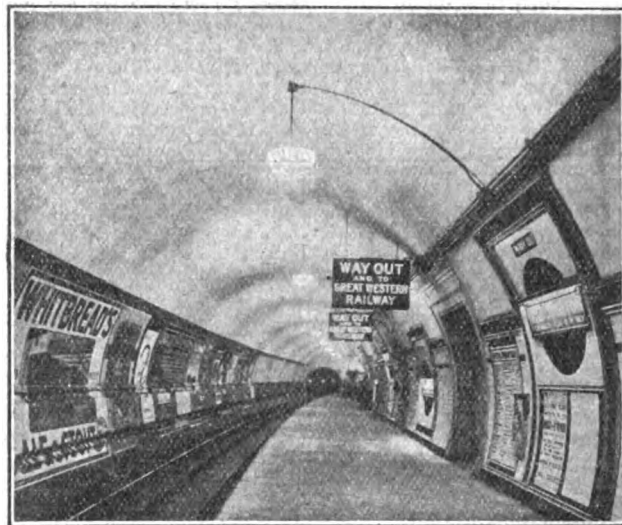
IN our next issue will be published the results of the latest of Messrs. A. P. Lundberg & Sons' periodical competitions or examinations in "Electric-Light Switching," directed particularly to the control of incandescent lamp circuits by means of more or less special types of tumbler switch. Those who have not given much attention to the subject will doubtless wonder what there is therein to afford a foundation for three grades of examinations. They will cease to wonder if they dip into a little booklet entitled, "Lektrik Lighting Connections," issued by the above firm, and upon which the examinations are based. The list of competitors (which includes only those whose papers were satisfactory) is remarkable both as regards the number and the varied positions of the candidates. We are informed that a great many are engaged every day in electric light work in various capacities, but, on the other hand, there is a fair sprinkling of graduates and students of the I.E.E. This shows that the subject has proved of interest to classes of electrical workers who do not generally trouble about examinations; and to some who might be prone to regard electric wiring as beneath their consideration.

The arrangement of lighting circuits to obtain the utmost refinements of control is a branch of electrical work deserving more attention than it often receives, and with a view to encouraging its study we have made arrangements for the publishing of the next examination papers in ELECTRICAL

ENGINEERING during November next. The Preliminary Grade should form a useful preliminary study to those who intend afterwards to sit for the City Guilds' Examination in Electric Wiremen's work; and the Intermediate and Advanced Grades will afford plenty of scope for those who have not yet tried their hands at multipoint variable, restrictive, master, pilot, and various other kinds of lamp circuits. An important feature of some of these controls is that they are being largely used in electric heating apparatus; and there are quite a number specially devised for small motors and miscellaneous purposes.

### UNDERGROUND STATION LIGHTING

THROUGH the courtesy of the Underground Railway Authorities, and of the General Electric Co. (87 Queen Victoria Street, E.C.), we are enabled to illustrate another example of underground station lighting, carried out by Osram lamps in conjunction with "Superlux" glassware. The in-



STATION PLATFORM AT PADDINGTON (BAKER STREET AND WATERLOO RAILWAY).

stallation in question is at the recently-opened Paddington station of the Bakerloo line, and the photograph reproduced, which was taken entirely by the light from the ordinary lamps, shows the brilliance and uniformity of the illumination produced.

### RESTAURANT LIGHTING

THE lighting of some of the principal rooms at the Criterion Restaurant has recently been rearranged by the equipment of the fittings with Mazda lamps and Veluria reflectors, supplied by the British Thomson-Houston Co., Ltd.



THE GRILL ROOM AT THE CRITERION RESTAURANT.

(Mazda House, 77 Upper Thames Street, E.C.), and a considerable improvement in the illumination has been the result. The installation in the grill room, which is illustrated here, consists of seventy 40- and 60-watt Mazda lamps in intensive

type Veluria reflectors. There are also 158 20- and 40-watt units in the Victoria and Grand Halls, while the vestibule of the latter is lighted by four 100-watt Mazda lamps in Veluria shades. It may be mentioned that this form of lighting was installed first in the grill room as an experiment. The success of the experiment is indicated by the fact that the same system of lighting has now been extended throughout the restaurant.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Ayr.**—A loan of £25,000 for plant extensions is to be applied for.

**Belfast.**—Electric cables for Belfast Harbour Board. Harbour Engineer. April 29th.

**Belgium.**—Tenders are invited by the municipal authorities for electric cable by May 4th, and for three transformer sub-stations by May 18th. Burgomaster, Hôtel-de-Ville, Antwerp. Copies of the specification may be seen at 73 Basinghall Street, E.C.

**Braintree.**—The electric lighting scheme prepared by Mr. H. P. Girling, referred to in our last issue, has been adopted by the Council.

**Flint.**—An electric lighting scheme at an estimated cost of £5,000 is under consideration by the Council.

**Guisborough.**—An electric lighting scheme is under consideration by the Council.

**Inverurie.**—Negotiations are being carried on with the North British Railway Co. for a supply of electrical energy in bulk.

**Leeds.**—12,000-kw. turbo-alternator, condensing plant. Manager, Electricity Department. May 11th.

**London: Southwark.**—The Electricity Department requires 110 yards of 0.5 sq. in. three-core, paper-insulated and lead-covered cable. Borough Electrical Engineer. April 29th.

**Walsall.**—A loan of £3,000 for mains extensions is to be applied for.

### Wiring

**Lincoln.**—Wiring of Nurses' Home and Ward at County Hospital. Secretary.

**London: Lambeth.**—Electric motors and wiring installation at the infirmary, Brook Street, Kennington Road. Clerk to Guardians.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make enquiries to ascertain whether electrical work will be required.*

**Bath.**—New Territorial drill hall.

**Cardiff.**—Fire station in Westgate Street. Town Clerk.

**Northampton.**—New post office. H.M. Office of Works, Storey's Gate, London.

**St. Alban's.**—County school at Fleetville. County Surveyor, Hatfield.

**Stockport.**—Bakery and warehouse buildings for Stockport Co-operative Society. Architects, Wrathmell & Blackshaw, St. Peter's Square.

**Worcester.**—Elementary school, Stanley Road. City Architect.

### Miscellaneous

**Dover.**—A loan of £1,600 is to be taken up for the conversion of further gas lamps to electricity.

**Spain.**—Four electric portal cranes are required for the port of Cadiz. Junta de Obras del Puerto de Cadiz.

## TENDERS RECEIVED AND ACCEPTED

**Birmingham.**—Contracts for electrical stores for the ensuing year have been placed by the Birmingham, Tame & Rea District Drainage Board with the General Electric Co., Electrical Trades Supply Co., and Callender's Cable & Construction Co.

**Bootle.**—A contract has been placed with the B.T.-H. Co. for a twelve months' supply of M.H. mercury meters.

**Bristol.**—The Tramways Co. has placed a contract with Siemens Bros. Dynamo Works for a twelve months' supply of carbon-filament lamps.

**Canada.**—The Westinghouse Cooper Hewitt Co. has received a contract from Messrs. Vickers, of Montreal, for the lighting of their shipbuilding yard at Maisonneuve.

**Dundee.**—The contract for a 750-kw. rotary-converter has been placed with the British Thomson-Houston Co.

**Halifax.**—The following tenders have been accepted for the supply of stores for 1914-15:—Carbon lamps, lampholders, tumbler switches, and bow cut-outs, London Commercial Electric Stores; metal-filament lamps, L. Andrew & Co., and the Corona Lamp Co.; general electrical accessories, British Insulated & Helsby Cables, British Thomson-Houston Co., India-Rubber, Gutta-Percha and Telegraph Works Co., and W. Geipel & Co.; cables, Northern Electric Wire Co.; telephone wire, Gillespie & Beales; E.H.T. and L.T. cable, British Insulated & Helsby Cables; A.C. meters, Chamberlain & Hookham; D.C. meters, Chamberlain & Hookham and Ferranti; house service meters, British Insulated & Helsby Cables.

**London: Admiralty.**—The Edison & Swan United Electric Light Co. has secured part of the twelve months' contract for the supply of Royal Ediswan lamps.

**Newport (Mon.).**—A contract has been placed with Siemens Bros. Dynamo Works, for a supply of carbon-filament lamps.

**Pontypridd.**—The following contracts have been placed for electrical stores during the next twelve months:—Overhead equipment, Brecknell, Munro & Rogers, Imeson, Finch & Co., Fleming, Birkby & Goodall, Haslam & Schontheil, Watlington & Co., W. F. Dennis & Co., British Insulated & Helsby Cables; joint boxes and service boxes, British Insulated & Helsby Cables, W. Lucy & Co., Sykes & Sugden; insulating material, L. Andrew & Co., Baxendale Bros., British Thomson-Houston Co., Micanite & Insulators Co., Siemens Bros. & Co., India-Rubber, Gutta-Percha & Telegraph Works Co., W. T. Henley's Telegraph Works Co., Armorduct Manufacturing Co., Brecknell Munro & Rogers, British Westinghouse Electric & Manufacturing Co.; tram-car equipment, P. R. Jackson & Co., British Thomson-Houston Co., Morgan Crucible Co., Haslam & Schontheil, Fleming, Birkby & Goodall, The Equipment & Engineering Co., Siemens Bros. & Co.; installation stores, H. A. Jackson & Co., Ward & Goldstone, Metallic Seamless Tube Co., Edison & Swan United Electric Light Co., Veritys, Ltd., Siemens Bros. Dynamo Works, Berry, Skinner & Co., General Electric Co., Baxendale Bros., Drake & Gorham, British Thomson-Houston Co., India-Rubber, Gutta-Percha & Telegraph Works Co., Wandsworth Electric Manufacturing Co., British Thomson-Houston Co., Siemens Bros. Dynamo Works, General Electric Co., Cryselco, Ltd.; cables, Macintosh Cable Co.; flexible cable, Callender's Cable & Construction Co.

**Salford.**—The Tramways Department has placed a contract with Siemens Bros. Dynamo Works for a twelve months' supply of Wotan, Tantalum, and carbon-filament lamps.

**South Shields.**—The following contracts have been placed by the Electricity Department:—Feed pumps, G. & J. Weir; induced draught plant, Musgrave & Co.

**Walsall.**—A contract has been placed with Callender's Cable & Construction Co. for 277 yds. of mains to link up the Marlow Street and Darwall Street sub-stations, at £1,015.

**West Hartlepool.**—A contract has been placed with the Bastian Meter Co. for the supply of meters up to 10 amperes.

**Wrexham.**—The following tender has been accepted for carbon filament lamps:—Edison & Swan United Electric Light Co., 8, 16, and 25 -c.p. 5s. 3d. per dozen, 32-c.p. 6s. per dozen. Seventeen tenders were received.

Messrs. Venner & Co. have received the contract for both ordinary and prepayment meters (Chamberlain & Hookham) for Colchester. Messrs. Chamberlain & Hookham have received contracts for the supply of meters to Birmingham, West Hartlepool, and Holyhead.

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JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.



### LOCAL NOTES

**Carlisle: Plant Extensions.**—The Local Government Board has sanctioned the borrowing of £16,958 for the extensions of plant recently advertised, but has asked for further information with regard to the proposed second alternator and rotary-converter.

**Dover: Public Lighting.**—Mr. L. W. Woodman, the Borough Electrical Engineer, has reported upon a proposed further conversion from gas to electricity for street lighting.

**Dudley: Public Lighting.**—Already improvements are showing themselves in the Dudley electricity undertaking, consequent upon its acquisition by the Worcestershire, Staffordshire & Shropshire Electric Power Co. The introduction of new lamps for street lighting purposes has greatly improved the public lighting, and a new sub-station and central offices are under construction.

**Edinburgh: New Power Station.**—A special sub-committee has been considering a report by the consulting engineer, Sir Alexander Kennedy, to the effect that it will be necessary at an early date to take steps to extend the generating plant of the electricity undertaking. The matter has been treated from two points of view, viz., extending the M'Donald Road station, and erecting a new station. One of the difficulties in the way of the first proposal is that an additional expenditure of £40,000 will be required for condensing plant than would be necessary at a new station. This proposition was therefore reported against by Sir Alexander Kennedy, and the acquisition of a site at Portobello for the erection of a new station is recommended.

**Galashiels: Electric Supply.**—The Council has at last agreed with the Galashiels & District Electric Supply Co. as to the various details in the Company's proposed electric lighting order, to which consent has now been given.

**Keith: Electric Lighting.**—The Council is endeavouring to arrange an interview with the India-Rubber, Gutta-Percha and Telegraph Works Co., which is putting in an electric light installation in Lossiemouth, with a view to a similar installation being put down in Keith.

**Lytham: Bulk Supply.**—An agreement has at last been reached for taking a supply of electrical energy in bulk from the St. Anne's-on-Sea Council. The supply will be given at the boundary of the district on the terms of £5 per kw. for a maximum demand up to 100 kw.; £4 between 100 and 200 kw.; £3 10s. between 200 and 300 kw.; and £3 between 300 and 400 kw. plus ½d. per unit in all cases up to 200,000 units, and 1½d. per unit for all current taken beyond this quantity.

**Macclesfield: Electric Supply.**—The new Electricity Co. of Macclesfield inaugurated the supply of electricity last week.

**Swindon: Power-House Extensions.**—Tenders were recently received for additional foundations and condenser pit for the new plant at the electricity works, but the Electricity Committee has decided not to accept any tenders, and to carry out the work itself under the direction of the Borough Surveyor and the Electrical Engineer.

**Taunton: Plant Extensions.**—The Local Government Board has formally sanctioned the borrowing of £4,765 for new generating plant for which tenders have already been invited.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £66 10s. to £67. (Last week, £67 to £67 10s.)

**Agencies.**—T. W. Broadbent, Ltd. (Victoria Electrical Works, Huddersfield), have appointed James C. Fisher & Co. (62 Robertson Street, Glasgow) to represent them in Scotland for sale of motors, generators, &c. Mr. J. D. Mackenzie, formerly their Scottish agent, has ceased to represent them.

Mr. F. J. Lyons-Davis (23 Victoria Avenue, Cardiff) has been appointed sole agent in South Wales for Mawdseley's, Ltd. (Dursley), for the sale of their patent "Zone" dynamos and motors.

**Bankruptcies.**—W. H. Pease, Royal Hotel Shops, Scarborough, has been adjudicated bankrupt.

The trustee in the bankruptcy of J. Cunnington and H. P. Allison, trading as Laing, Wharton & Cunnington, at 7 Great Newport Street, London, has been released.

The first meeting of creditors of D. Smith & Co., dealers in electric lamps, 2 and 3 Red Lion Court, Fleet Street, E.C., will be held on April 29th at 11.30, at Bankruptcy Buildings, Carey Street, London. The public examination will take place on May 26th, at 11 a.m., at the same address.

A first and final dividend of 6s. 2d. in the £1 will be paid on April 28th at 27 Ainsworth Street, Blackburn, in the bankruptcy of J. W. Garsden, Electrical Engineer, 24 Preston New Road, Blackburn.

**Liquidation.**—The official receiver's report in the liquidation of the Grindell-Matthews Wireless Telephone Syndicate shows liabilities at £6,238, and assets valued at £24,761, after payment of all duties. A committee of inspection has been appointed.

### APPOINTMENTS AND PERSONAL NOTES

The salary of Mr. A. Prentice, Station Superintendent at the Walsall Electricity Works, is to be increased from £200 to £225 per annum.

The Malvern U.D.C. has received thirty-three applications for the post of Electrical and Gas Engineer, rendered vacant by the removal of Mr. W. H. Johns to West Bromwich. The salary is £350 rising to £400 per annum. The list of three consists of Mr. R. A. S. Browning, Assistant Engineer and Works Superintendent, Birmingham Gas Works; Mr. Walter Gregson, Superintendent of the Eastcroft Gas Works, Nottingham; and Mr. S. T. Smith, Engineer and Manager of the Leek Urban Council's Gas Department.

The salary of Mr. W. G. Pickvance, Borough Electrical Engineer at Wrexham, is to be increased from £275 to £325, and there will be two further annual increments of £25.

The South Wales Electrical Power Distribution Co. requires an assistant in the testing department. (See advertisement on another page.)

Several junior engineers are required for the contract department of a motor manufacturing firm in Manchester. (See advertisement on another page.)

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Johnson & Phillips.**—The trading profit for 1913 was £33,175, to which is added £3,315 brought forward from 1912. After deducting debenture interest and writing off £6,155 for depreciation on machinery and plant, a balance of £12,755 is carried forward.

**Willans & Robinson.**—There was a net profit of £8,782 last year, after payment of debenture interest, provision for depreciation, and the upkeep of Queen's Ferry Works. Important contracts for steam turbine installations and Diesel oil engines were concluded during the year, and the business in hand is promising.

**Brush Electrical Engineering Co.**—At the annual meeting on Monday, the report and accounts given in our issue for April 16th, page 221, were adopted. Mr. E. Garcke, who presided, drew particular attention to the fact that the Company is now on the up grade, and that the conditions of the Company's operations are less harassing than they have been for some years. Particular reference was also made to the installation of the first Ljungstrom steam turbine in this country at the Willesden station of the North Metropolitan Electric Power Supply Co., the conditions of this contract being that the set should be subject to a lengthy trial under service conditions before acceptance. This test has been duly completed, and the generating set has been taken over by the Power Co.

**Faraday House Electrical Engineering College.**—At the recent examination for entrance scholarships held at Faraday House, Mr. W. G. Radley, of Leeds Modern School, was awarded the Faraday Scholarship of 50 guineas per annum, tenable for two years in College and one year in Works, and Mr. C. H. B. Ewbank, of Epsom College, the Maxwell Scholarship of 50 guineas per annum, tenable for one year in College and one year in Works.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published April 16th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

4,779/13. **Receivers for Wireless.** F. J. CHAMBERS. The receiver is connected directly or inductively to an oscillatory circuit, with an inductance of at least 20 henries and low decrement, tuned to the group frequency or a multiple of the received oscillations. The coupling may be effected through an iron-cored transformer, whose primary is in series with the detector and telephone. The oscillatory circuit should be tuned to approximate to the natural period of the telephone diaphragm. Arrangements to reduce the transformer losses are shown. Nine figures.

7,600/13. **Stator Windings of Turbo-Alternators.** B.T.-H. Co., F. H. CLOUGH, and L. DUNKER. To minimise the trouble due to eddy currents the winding consists of more than two rectangular component bars transposed in the slot. The two outer bars are bent at two places, and the inner bar or bars are bent at three places. Eight figures.

7,610/13. **High-Power Transmitters for Wireless.** G. MARCONI and C. S. FRANKLIN. The main discharges are timed to occur in correct relation to the phase of the current in the aerial. The main circuit contains a condenser, which is alternately charged and discharged in opposite directions, and spark-gaps which the main current cannot pass across unless assisted by a disc discharger in an auxiliary circuit. One figure.

15,148/13. **Closing Induction Motor Slots.** SIEMENS DYNAMO WORKS, C. A. B. D. KOETTGEN and E. O. KIEFFER. A trough-shaped key of magnetic material is inserted in the slots. It has lapped-over edges, and a base with a kink or depression, which is straightened after insertion.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

*Names in italics indicate communicators of inventions from abroad. Summaries of some of the more important of these patents will appear in our next issue.*

**Arc Lamps:** B.T.-H. Co. (*G.E. Co., U.S.A.*) 8,416/13; MARKS (*Siemens-Schuckertwerke Ges.*) [Search-lights] 18,997/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** SIEMENS-SCHUCKERTWERKE GES. [Loom driving] 7,842/13; [Automatic control through relays] 27,824/13; [Controlling motors for ship propulsion] 13,148/13; WATERS [Protective systems] 25,274/13; CHASE [Armouring cables] 29,028/13.

**Dynamos, Motors, and Transformers:** PEUGEOT, 7,840/13; MASON [Dynamos] 8,128/13; BROWN, BOVERI ET CIE [Cooling] 14,941/13; CHRISTIE (*Galvanische Metall-Papier Fabrik A.-G.*) [Brushes] 25,464/13.

**Electrometallurgy and Electrochemistry:** HELBRONNER, VON RECKLINGHAUSEN, and HENRI [Milk sterilisation] 7,428/13; GUGGENHEIM [Smelting] 23,004/13; FRIEDR. KRUPP A.-G. [Electrodes] 6,055/14.

**Heating and Cooking:** RIPPINGILLE [Irons] 13,063/13; WILKINSON [Water heaters] 28,847/13.

**Ignition:** SIEMENS & HALSKE A.-G. [Plugs] 18,924/13.

**Incandescent Lamps:** BECKWITH, 8,124/13.

**Instruments and Meters:** A.E.G. [Ampere-hour meter] 9,503/13; ELSTER [Commutators] 5,365/13.

**Switchgear, Fuses, and Fittings:** KETTERING [Automatic regulators for supply systems] 7,544/13 and 7,546/13; LUNDBERG and PEGG [Plugs and sockets] 9,460/13; LUCAS and HANDLEY [Switches] 13,721/13; POULSEN [Switches] 14,034/13; LUCAS and VERITYS [Indirect lighting fittings] 14,170/13; DAY [Lamp-holders] 15,318/13; LUCAS [Switches] 16,885/13; SIEMENS-SCHUCKERTWERKE-GES. [Switches] 17,532/13; BLOXAM (*Robert Bosch*) [Lanterns] 17,954/13; SIEMENS DYNAMO WORKS, LYDALL and BROOKS [Remote controlled switches] 20,870/13.

**Telephony and Telegraphy:** BERNER and DE LISLE [Grappels for raising submarine cables] 25,176/13.

**Traction:** FORSE and SPILLER [Railway signalling] 7,582/13; TAYLOR [Railway signals] 18,801/13.

**Miscellaneous:** WADE (*Schneider & Naujoks Elek. Ges.*) [Overhead lamps] 7,245/13; JACOB and WHITE [Illuminated signs] 7,586/13; MACDONALD [Bells and gongs] 7,638/13; JANSSENS [Synchronising automatic musical instruments and cinematographs] 7,694/13; WALTER [Luminous electrolytic devices] 8,115/13; HELMANN [Mercury vapour lamps] 8,172/13; HAIGH [Starting and stopping a stop-watch] 13,019/13; RENCZEWITZ [Burglar alarms] 20,028/13; SAND and REYNOLDS [Gas-tight seals between metal and vitreous material] 23,854/13; HITZELBERGER and THE NEW BRIT. EVER-READY Co. [Pocket lamps] 24,944/13; BUCKY [Obtaining Röntgen-ray images] 2,815/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** HOCHSTAEDTER [Conductors] 7,766/14.

**Dynamos, Motors, and Transformers:** BROWN, BOVERI ET CIE. [Metal vapour rectifiers] 186/14.

**Switchgear, Fuses, and Fittings:** CHABIER [Reflector arm for electric lamps] 4,627/14.

**Telephony and Telegraphy:** CHAUDET [Crystal detectors] 2,935/14; SIEMENS & HALSKE A.-G. [Supervising apparatus for automatic and semi-automatic telephony] 7,327/14.

**Traction:** BROWN, BOVERI ET CIE. [Braking] 7,265/14.

**Miscellaneous:** ZEHDEN [Burglar alarms] 7,266/14.

The following Amended Specification may now be obtained:—  
**Ignition:** H. G. and W. W. LONGFORD and W. A. CLARK (Sphinx Mfg. Co.) [Sparking plugs] 20,207/11.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

7,471 of April 23rd, 1900. **Quadruplex Submarine Telegraphy.** S. G. BROWN. Two or more transmitters are connected to the cable so that they simultaneously control their batteries, which are of different pressures, to work in series with one another. The receivers are provided with recorders for recording separately, on both sides of their zero lines, the respective sets of signals. An automatic transmitter has two sets of signalling levers, for controlling the batteries, operated by a single perforated tape. The receiving relay closes the circuits of the recording relay only about the middle of every received signal.

7,678 of April 25th, 1900. **Written Character Telegraphs.** A. POLLÁK, J. VIRÁG, J. EGGER, and F. SILBERSTEIN. For each separate element of a written character current impulses are sent automatically into the line of such polarity, strength and succession that they represent the direction, extent, and mutual distance of the parts. An optical telephone is used as receiver.

7,777 of April 26th, 1900. **Wireless Telegraphy.** G. MARCONI the MARCONI Co. The claims of this historic patent are (1) A transmitter for electric wave telegraphy consisting of a spark producer having its terminals connected through a condenser with one circuit of a transformer the other circuit being connected to a conductor and to earth or a capacity the time period of electrical oscillations in the two circuits being the same or harmonics of each other. (2) A system of electric wave telegraphy in which both the transmitter and the receiver contain a transformer the time period of electrical oscillations in the four circuits of the two transformers being the same or harmonics of each other. (3) A system of electric wave telegraphy in which both the transmitter and the receiver contain a transformer one circuit of which is a persistent oscillator and the other a good radiator or absorber of electrical oscillations all four circuits having the same time period or being harmonics of each other.

### Amendments to Specification

4,677/06. **Enclosed Flame Arc Lamps.** BLONDEL. The desired amendments (ELECTRICAL ENGINEERING, Dec. 18th, 1913, p. 718, Vol. IX.) have now been made.

### Grant of Patent Allowed

12,753/13. **Tungsten Lamp Spiders.** WOLFRAM LAMPEN A.-G. The Comptroller has allowed the Grant of this Patent, which was opposed by Brimsdown Lamp Works (ELECTRICAL ENGINEERING, April 2nd, 1914, p. 186).

### Opposition Entered to Grant of Patents

1,915/13. **Manufacture of Tungsten for Drawing into Filaments.** B. T.-H. Co. (*G.E. Co., U.S.A.*). Opposition to the Grant of this Patent (see ELECTRICAL ENGINEERING, Feb. 26th, 1913, p. 118), has been entered by Brimsdown Lamp Works, which cites eight patents as alleged anticipations. Included is No. 5,026/12 granted to J. Hubers on behalf of J. Pintach A.-G. 19,857/13. **Anti-vibration Holder for Incandescent Lamps.** F. H. REEVES (Cable Accessories Co.). Opposition to the Grant of this Patent has been entered.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors, and Transformers:** E. ARNOLD and J. L. LA COUR [Single-phase motor] 184/05; E. B. RAYMOND and H. M. RAMP [Transformer casings] 28,427/07.

**Incandescent Lamps:** H. HIRST and WOLFRAM (TUNGSTEN) METAL FILAMENT LAMPS [Leading-in] 142/09.

**Switchgear, Fuses, and Fittings:** J. H. DRYSDALE [Plug for use in bayonet or ordinary plug socket] 194/09.

**Miscellaneous:** D. PERRET [Electric clock winding] 157/01.

# TRADES DIRECTORY OF ADVERTISERS IN "ELECTRICAL ENGINEERING."

(One Free Entry is given to every Advertiser. Entries under additional headings, 6d. per insertion.)

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Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
Electrical Co., Ltd., 122 to 124, Charing Cross Rd., W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Gulib rt-Martin, 9, Edmund Place, E.C.  
Haslam & Schontheil, Ltd., 11, Windsor Place, Cardiff.  
Landbars (A. P.) & Sons, Liverpool Rd., N.  
Scholey & Co., Ltd., 151, Queen Victoria St., E.C.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., W.C.  
Sun Electrical Co., Ltd., 118, Charing Cross Road, W.C.  
Wardle Engineering Co., Ltd., 196, Deansgate, Manchester.

## ACCUMULATORS, &c.

Copper, Pass & Son, Ltd., Bedminster Smelting Works, Bristol.  
D.P. Battery Co., Ltd., Bakewell, Derbyshire.  
Electrical Power Storage Co., Ltd., 4, Great Winchester St., E.C.  
Hart Accumulator Co., Ltd., Marshgate Lane, Stratford.  
Naylor Battery Co., 1, Lammermoor Rd., Balham, S.W.  
Tudor Accumulator Co., Ltd., 8, Central Buildings, Matthew Parker St., S.W.

## ARC LAMPS AND ACCESSORIES.

Drake & Gorham, Ltd., 66, Victoria St., S.W.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electric Firm, Croydon.  
Oliver Arc Lamp Ltd., Cambridge Place, Burrage Rd., Woolwich.

## ARMATURE REPAIRS.

Marryat & Place, 28, Hatton Garden, E.C.

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Callenders Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
General Cable Manufacturing Co., 15, Garlick Hill, E.C.  
Gillies & Beale, Amberly House, Norfolk St., W.C.  
Hensley (W. T.) Telegraph Works Co., Ltd., Blomfield Street, E.C.  
Hooper's Telegraph & Indiarubber Works, Millwall Docks, E.  
India Rubber, Gutta Percha & Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
and Silvertown, E.  
Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.  
London Electric Wire Co. & Smiths Ltd., Playhouse Yard, Golden Lane, E.C.  
Macintosh (Chas.) & Co., Ltd., 22 & 23, Jewin St., E.C.  
Rickard (Wm.), Ltd., Ashbourne Road Mills, Derby.  
St. Helens Cable & Rubber Co., Ltd., Warrington.  
Siemens Bros. & Co., Ltd., Woolwich.  
Union Cable Co., Ltd., Dagenham Dock, Essex.

## CASTINGS, &c.

Dore (J.) & Co., Bromley, E.

## CATALOGUES AND PROCESS ENGRAVING.

Swain (John) & Son, Ltd., Shoe Lane, E.C.

## CONDENSERS (Electrical).

Telegraph Condenser Co., Ltd., Vauxhall St., Kensington Oval, S.E.

## CONDENSING PLANTS.

Balcke & Co., Ltd., Broadway Court, Westminster, S.W.  
Muirhead Watson Co., Ltd., Scotland Street, Glasgow.  
Storey (Isaac) & Sons, Ltd., Empress Foundry, Cornbrook, Manchester.  
Williams & Robinson, Ltd., Rugby.

## DIE-FINISHED CASTINGS.

Aerators, Ltd., Upper Edmonton, N.

## DYNAMOS, see Motors and Dynamos.

## ELECTRO-PLATING.

Ganning (W.) & Co., 133 to 137, Gt. Hampton St., Birmingham.

## FLEXIBLE METALLIC TUBING.

United Flexible Metallic Tubing Co., Ltd., 112, Queen Victoria St., E.C.

## HEATING AND COOKING APPARATUS.

Belling & Co., Lancaster Works, Derby Road, Edmonton, N.  
British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Downing Radiant Heat Co., Ltd., 105, Great Portland St., W.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electrical Trading Co., Ltd., 185, Wardour St., W.C.  
Redglo, Ltd., 647, Royal Liver Bldgs., Liverpool.  
Schniewindt Electric Co., 40-1, Stamford St., Birmingham.  
Siemens Bros. Dynamo Works, Ltd., 39, Upper Thames St., E.C.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., E.C.  
Townshend's Art Metal Co., Ltd., Ernest St., Birmingham.

## ICE-MAKING MACHINERY.

Drake & Gorham, Ltd., 66, Victoria St., S.W.

## INSTRUMENTS.

Everett, Edgcombe & Co., Ltd., 117, Victoria St., S.W.  
Everard & Vignoles, Ltd., Acton Lane Works, Chiswick.  
India Rubber, Gutta Percha and Telegraph Works Co., Ltd., 106, Cannon St., E.C.  
Kadelbach & Randh gen, Berlin—Wilmersdorf.  
Kelvin, Bottomley & Co., Ltd., 18, Cambridge St., Glasgow.  
Nalder Bros. & Thompson, Ltd., 34, Queen Street, E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.

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Fredk. Crane Chemical Co., Armoury Close, Bordesley Green, Birmingham.  
Griffiths Bros. & Co., Marks Rd., Bermondsey, S.E.  
Northern Varnish Co., Allerton, Bradford.  
Sterling Varnish Co., Royal London Buildings, 196, Deansgate, Manchester.

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MacIntyre (J.) & Co., Ltd., Burslem.  
Moseley (D.) & Sons, Ltd., Ardwick, Manchester.  
Messers & Mitchell, 122 to 124, Golden Lane, E.C.  
Sugg (William) & Co., Ltd., 63, Regency Street, S.W.  
Traut (Dr. Heur.) & Sons, 25, Goswell Rd., E.C.  
Weidmann (H.), Rappertswil, Switzerland.  
Werths & Co., 41, Aldersgate Street, London, E.C.

## INSURANCE.

Phoenix Assurance Co., Ltd., 19 & 70, Lombard St., E.C.

## LADDERS.

Heathman & Co., 10, Parsons Green, S.W.

## LAMPS (Incandescent).

British Thomson-Houston Co., Ltd., Mazza House, 77, Upper Thames St., E.O.  
Cryselco, Ltd., Kempston Works, Bedford.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Pope's Electric Lamp Co., Ltd., Hythe Road, Willenden, N.W.  
Siemens Bros. Dynamo Works, Ltd., Tyssen St., Dalston, N.E.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., W.C.  
Stearn Electric Lamp Co., Ltd., 47, Victoria St., S.W.  
Watlington & Co., Ltd., 48, Milton St., E.C.  
"Z" Electric Lamp Mfg. Co., Ltd., Orient House, New Broad St., E.O.

## LIFTS.

Marryat & Place, 28, Hatton Garden, E.C.

Waygood (R.) & Co., Ltd., Falmouth Road, S.F.

## MACHINE TOOLS.

Taylor & Challen, Ltd., Constitution Hill, Birmingham.

## METERS.

Bastian Meter Co., Ltd., Kentish Town, N.W.  
British Thomson-Houston Co., Ltd., Rugby.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
Isaria, Ltd., 208, Tower Bridge Road, S.E.

## MICA.

British Mica Co., Ltd., Lebanon Road Works, Wandsworth, S.W.  
Jaroslaw (D.), 19, Tower Hill, E.C.  
Micanite & Insulators Co., Ltd., Walthamstow, E.  
Wiggins (F.) & Sons, 102 to 104, Minorities, E.C.

## MINE EQUIPMENTS AND APPARATUS.

Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Reynolds & Co., Ltd., Hebburn-on Tyne.  
Siemens Bros. Dynamo Works, Ltd., Caxton House, Westminster, S.W.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.  
Williams & Robinson, Ltd., Rugby.

## MOTORS AND DYNAMOS.

British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Brown Boveri & Co., Ltd., Caxton House, Westminster, S.W.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
London & Rugby Engineering Co., Ltd., 10, Bush Lane, E.C.  
Matthews & Yates, Ltd., Swinton, Manchester.  
Peabbles (Bruce) & Co., Ltd., Edinburgh.  
Siemens Bros. Dynamo Works, Ltd., Caxton House, Westminster, S.W.  
Vickers, Ltd., River Don Works, Sheffield.

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## PACKING.

United States Metallic Packing Co., Ltd., Bradford.

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Lorvain (J. G.), Norfolk House, Norfolk St., W.C.  
Raworth (J. E.), 30, Broadway, Westminster.

## PUMPING PLANT.

Merryweather & Sons, Fire Engine Works, Greenwich, S.E.  
Williams & Robinson, Ltd., Rugby.

## STAMPINGS.

Harris (A. E.) & Co., 95, Camden St., Birmingham.

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Allen (W. H.) Son & Co., Ltd., Queen's Engineering Works, Bedford.  
British Thomson-Houston Co., Ltd., Rugby.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
J. Howden & Co., Ltd., 195, Scotland St., Glasgow.  
Vickers, Ltd., River Don Works, Sheffield.  
Williams & Robinson, Ltd., Rugby.

## STEAM ENGINE ACCESSORIES.

Lee Recorder Co., Ltd., 32, Deansgate, Manchester.

## SWITCHGEAR.

British Thomson-Houston Co., Ltd., Rugby.  
Dorman & Smith, Ltd., Ordsall Electrical Works, Salford.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
Igrante Electric Co., Ltd., 147, Queen Victoria St., E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
Reynolds & Co., Ltd., Hebburn-on Tyne.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.

## TECHNICAL BOOKS AND JOURNALS.

Cambridge University Press, Fetter Lane, E.C.  
Cassell & Co., Ltd., La Belle Sauvage, E.C.  
Caxton Publishing Co., Clun House, Surrey Street, Strand, W.O.  
Constable (Archibald) & Co., Ltd., 10 Orange St., Haymarket, W.  
Crosby Lockwood & Son, 7, Stationers' Hall Court, E.C., and 5, Broadway.  
Electric Journal, Donington House, Norfolk St., Strand, W.O. [Westminster, S.W.]  
Gresham Publishing Co., 34, Southampton St., W.C.  
Griffin (Chas.) & Co., Ltd., 12, Exeter St., Strand, W.C.  
Indian Industries and Power, 204, Temple Chambers, E.C.  
Longmans, Green & Co., 39, Paternoster Row, E.C.  
Macmillan & Co., Ltd., St. Martin's St., W.C.  
Whittaker & Co., 2, White Hart Street, Paternoster Square, London, E.O.

## TELEPHONES.

Drake & Gorham, Ltd., 66, Victoria St., S.W.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Graham (Alfred) & Co., St. Andrew's Works, Crofton Park, London, S.E.  
Siemens Bros. & Co., Ltd., Woolwich.  
Western Electric Co., Ltd., North Woolwich, E.

## TESTING LABORATORIES.

Electrical Standardising, Testing & Training Institution, Ltd. (Faraday House), 62 to 70, Southampton Row, W.C.

## TRANSPORTERS.

Bleicherts Aerial Transporters, Ltd., Egypt House, 36, New Broad St., E.O.

## WIRING CONTRACTORS. See page 17.

## WOODWORK CASING AND CONDUITS.

Jennings & Co., Pennywell Rd., Bristol.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 383 [VOL. X., No. 18]

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THURSDAY, APRIL 30, 1914.

[PRICE ONE PENNY.

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time or Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

SOME particulars of the process for manufacturing drawn tungsten filaments as practiced by the American General Electric Co. are given. (Page 236.)

THE balloting papers for the election of the new Council of the Institution of Electrical Engineers will be sent out to-morrow. (Page 236.)

AN article by Mr. E. P. Austin describes an inexpensive form of network feeder with bare aluminium overhead conductors supported by tramway poles. (Page 237.)

THE International Electrotechnical Commission has published its proposals for an international standard of copper resistance. (Page 237.)

A PAPER by Mr. A. M. Taylor, read before the Birmingham Local Section of the Institution of Electrical Engineers, described a method of obtaining from a three-phase supply, single-phase currents at three times the frequency, without the use of moving machinery. (Page 238.)

AT the last meeting of the Illuminating Engineering Society there was a discussion on the lighting of public vehicles. A uniform illumination of about 3 ft.-candles obtained from shaded direct lighting units was adjudged best. (Page 238.)

THE connections to be made in case of a breakdown of one of three mesh-connected transformers are discussed in our Questions and Answers columns. (Page 239.)

AN illustrated article describes a steam-driven generating station at a brewery, where electric driving is adopted. The exhaust steam is used for heating purposes. (Page 240.)

THE first annual dinner of the Diesel Engine Users Association was held last week. It is hoped, by discussing difficulties, to assist the manufacturers to improve the Diesel engines. (Page 241.)

A PAPER on wireless telegraphy by Mr. H. Fothergill read recently before the North East Coast Institution of Engineers and Shipbuilders is referred to under "Telephony and Telegraphy." An entirely new system of telephone charges is under consideration by the Post Office. (Page 241.)

AMONG the Patent Specifications published last Thursday are two describing semi-indirect lighting fittings. A method of loom driving is patented by Siemens-Schuckertwerke, and other patents relate to lampholders, electric irons, and the ventilation of turbo-alternators. A B.T.-H. patent for remote-control high-tension switches expires this week. (Page 242.)

A PAPER by Mr. H. W. Firth discussed at last Thursday's meeting of the Institution of Electrical Engineers dealt with the influence of traffic conditions on electric traction.—Electric trains will commence running to-morrow on the L. & N.W. Rly.'s line from Earl's Court to Willesden.—The trolley omnibus service at Dundee is to be discontinued.—A new electric ticket machine has been installed by the District Railway. (Page 243.)

A NUMBER of new electric heating and cooking appliances are described in our trade section, including a novel "convection griller" with oil-immersed heating elements. (Page 244.)

EXTENSIONS are under consideration at Preston, and new mains are to be laid in Wolverhampton.—Tenders are invited for flame arcs, overhead tram equipment, carbons, and meters for Australia. (Page 247.)

THE L.G.B. deferred sanctioning a loan for Ashton-under-Lyne for future extensions in 1910 until more particulars were forthcoming, and in the meantime the Corporation has spent the money and is only now re-applying for sanction for the loan.—Two electric refuse carts are to be tried by the Birmingham Corporation.—The Manchester Electricity Committee will contribute £30,000 towards relief of rates next year.—The new Macclesfield electricity works are briefly described. (Page 248.)

**Fire at C. A. Parsons & Co.'s Works.**—It is reported that on Saturday a small fire occurred at Messrs. C. A. Parsons' Close Works, Gateshead. It is said to have been caused through the short-circuiting of an electric wire in the machine shop. A small portion of the roof was destroyed, but the damage was not considerable, and the fire was extinguished by the company's own employees.



## ARRANGEMENTS FOR THE WEEK

SATURDAY, MAY 2ND.

*Association of Mining Electrical Engineers.*

5 p.m. Yorkshire Branch. Griffin Hotel, Boar Lane, Leeds. Discussion on "Electric Winding."

THURSDAY, MAY 7TH.

*Iron and Steel Institute.*

10.30 a.m. Annual meeting at Institution of Civil Engineers.

FRIDAY, MAY 8TH.

*Iron and Steel Institute.*

10.30 a.m. Annual meeting continued.

**The London Electrical Engineers.**

Headquarters (46 Regency Street, S.W.) open Sats. till noon.

Rating Exam. for all Cos. from 7 to 10 p.m. every Wednesday.

Min. range each evening this week, 7 to 9 p.m. Musketry at Purfleet, Wednesday, May 5th, 1 p.m. to dusk.

(To-day) THURSDAY, APRIL 30TH, C. Co. FRIDAY, MAY 1ST, D. Co. MONDAY, MAY 4TH, A. Co. TUESDAY, MAY 5TH, B. Co. THURSDAY, MAY 7TH, C. Co. FRIDAY, MAY 8TH, D. Co.

**MANUFACTURE OF DRAWN WIRE TUNGSTEN LAMPS**

M B. J. W. HOWELL, in an article in the *General Electric Review* (Schenectady), on the Manufacture of Drawn-Wire Tungsten Lamps, gives some information as to the practical production of tungsten wire filaments. The raw material is a concentrated ore of tungsten, from which pure tungsten oxide, a fine-grained yellow powder, is obtained. This is "doped" and reduced to tungsten metal by hydrogen in an electric furnace. The product is in the form of a very heavy, rather coarse-grained grey powder, and is formed into ingots about  $\frac{1}{2}$  in. square and 6 in. long by transversely applied pressure, no binder being used. The ingot is then heated in a hydrogen-filled electric furnace to a white heat, and afterwards to near melting point, long enough to sinter the ingot, which now has a high lustre. The square ingot now goes to a swaging machine. It is heated to a white heat, taken out into the open air, and swaged. During this process a cloud of tungsten oxide rises from the ingot, which is reheated and swaged several times until it becomes a round rod 0.03 in. diameter and 80 ft. long. The rod first begins to have a fibrous structure, when the diameter is reduced to 0.06 in., but at 0.03 in. the fibrous structure is well developed; but the rod can be easily broken by bending it backwards and forwards once or twice. From 30 mils the rod or wire is reduced in size by hot-drawing through diamond dies. The wire is heated to a bright-red heat, and is still red-hot after passing through the die. This degree of heating is continued until the wire is only 3 mils in diameter, which is about the size of the filament in a 100-volt 100-watt lamp. Below this, the temperature of drawing is reduced and the last drafts are made cold, as the wire is now quite ductile. During this drawing the wire is lubricated with graphite—this prevents oxidation, as well as acting as a lubricant. For the final drawings a perfect die, which reduces the diameter only slightly, is used. By this means very long pieces of uniform diameter can be made. The filament in the 10-watt 100-volt lamp is only about 0.75 mil in diameter.

The filament-supporting arms were originally of copper wire in the smaller, and of tungsten in the larger sizes, but the use of copper is now being discontinued. The filament is wound on the supports by hand.

**Birmingham Local Section of the Institution of Electrical Engineers.**—The annual report records the holding of eleven meetings during the session, with an average attendance of 51. The membership of the section (including 93 students) is 437. The committee for next session will consist of the following: *Chairman*—A. H. Railing; *Past Chairmen*—R. K. Morcom, M. Railing, A. M. Taylor; *Vice-Chairmen*—W. E. Sumpner, J. F. Lister; *Ordinary Members*—S. T. Allen, G. Barnard, F. W. Carter, H. Foulds, C. C. Garrard, S. H. Holden, H. R. Hudson, A. Home-Morton, N. B. Rosher, F. W. Schiller, C. M. Shaw, T. F. Wall, A. Willmott; *Hon. Sec.*—J. D. Morgan.

**The Institution of Civil Engineers.**—Among the awards for Papers read and discussed during the session are a Watt Gold Medal to Mr. T. Clarkson for his Paper on "Recent Developments in Commercial Motor Vehicles," and Telford Premiums to Messrs. W. Willox and S. P. W. D'A. Sellon for their Papers on "Rail Steels for Electric Railways" and "Rail Corrugation and its Causes" respectively.

## THE INSTITUTION COUNCIL ELECTION

THE balloting papers for the election of the new Council of the Institution of Electrical Engineers will be sent out to-morrow. As already announced in our issues of April 2nd and 16th, six new ordinary members of Council have to be elected, and eleven have been proposed. The candidates are:—Prof. B. Hopkinson, F.R.S.; Messrs. G. W. Partridge, W. H. Patchell, W. Ll. Preece, G. S. Ram, W. Slingo, A. A. C. Swinton, W. B. Woodhouse, R. J. Wallis-Jones, John Christie, and Frank Ayton. The first six of these are the Council's nominees. The list of members nominating Mr. Wallis-Jones was published in our issue of April 16th, and Messrs. John Christie and Frank Ayton may be regarded as the representatives of municipal electrical supply interests. Although they have not actually been officially nominated by the M.E.A. Council, practically all their proposers are the members of it. Mr. Ayton's nomination paper has been signed by Messrs. A. B. Cramb, A. H. Seabrook, R. A. Chattock, H. Faraday Proctor, T. Roles, J. Christie, S. L. Pearce, W. Wyld, T. E. Edgcome, and C. S. Davidson. Mr. Christie's nomination paper has been signed by Messrs. W. W. Lackie, F. Ayton, C. Furness, A. S. Blackman, J. W. Beauchamp, S. J. Watson, E. E. Hoadley, F. M. Long, W. A. Vignoles, and H. Richardson.

**Wiremen's Strike in London.**—Mr. Leonard G. Tate, Secretary of the London Electrical Masters' Association, asks us to state that nothing has arisen necessitating any fresh action being taken by the Association, nor the calling of a meeting of members. So far as we have been able to ascertain, there are still a few wiremen out on strike in London, and a certain amount of picketing is still going on, but wiring work has been carried out continuously since the strike first occurred, and there is still considerable work in progress. About a dozen men of the Maintenance Department of the Marylebone Borough Council's Electricity Department came out on strike yesterday, on account of Mr. Seabrook's refusal to stop hiring labour from contractors who refused to sign the Electrical Trades Union agreement. The men in question are employed for the maintenance of motors, arc lamps, &c., and represent about half the number of employees engaged for this purpose. The meter reader who gave trouble a few weeks ago, has, we understand, joined the strikers. We are informed that other workmen have been engaged in place of the men on strike.



Selecting the Institution Council.  
An Embarras de Richesse.

## AN OVERHEAD ALUMINIUM NETWORK FEEDER

By E. P. Austin

CIRCUMSTANCES often arise where an additional feeder to an outlying portion of a network, possibly a residential district, is required to deal with short peaks, to meet the extra demands of a cooking load, or to form an additional means of supply in the case of a mains disconnection. Such conditions do not warrant a heavy outlay, and when tramway standards are in existence along the desired route, an overhead aluminium feeder erected on them makes a cheap and reliable job. The following details of a line recently erected to meet such conditions may be of interest.

Three aluminium conductors of size 7/0174, 7/0123, and 7/0174 respectively are mounted on petticoat insulators in the same vertical plane on the span-wire standards of an existing tramway system for a distance of 1,200 yds. They are connected at each end to the network of a three-wire supply system. The sag is 12 in. for a span of 120 ft., so that the factor of safety is 10, taking 2,000 lb. as the breaking strain of the hard-drawn aluminium strand. A feature of the construction is the arrangement made to "earth" the "live" conductors in case of breakage, as shown in Fig. 1 in two elevations. The neutral (bottom) conductor is connected solid to "earth" at the station switchboard only, and in order to maintain the neutral insulation of the network, and at the same time use the bottom conductor as a guard wire, porcelain strain insulators are used on the

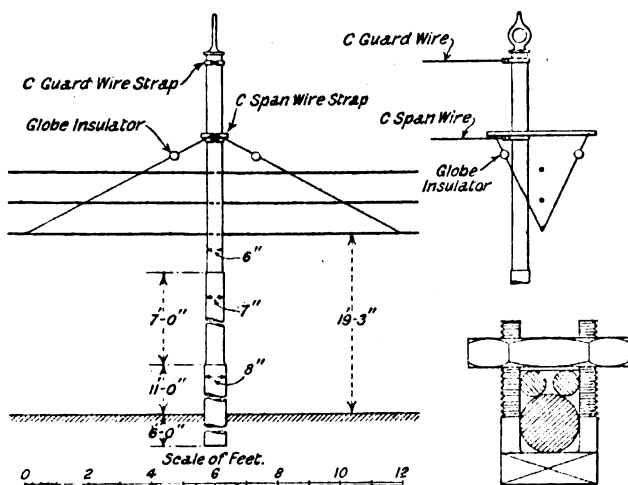


FIG. 1.—GENERAL ARRANGEMENT OF CONDUCTORS AND GUARD WIRES.

FIG. 2.—CLAMP FOR EARTH WIRES.

"earthing" wires, which are also of aluminium. The method of clamping the earth wires to the neutral is shown in detail in Fig. 2, which makes a neat and sufficiently strong joint. Aluminium bonds are used throughout; in fact, no other metal is brought into contact with the aluminium except at the terminal poles, where special clamps are employed to connect on to the copper leads, taken out of the cable end boxes. The construction of earthing wires described was adapted from a design originally suggested by Mr. A. P. Trotter, of the Board of Trade. Horn break lightning arresters, in conjunction with kicking coils, are used at the terminal poles on each wire. The only means of disconnection are provided in the network at each end of the line. The end connections between aluminium and kicking coils are made by means of aluminium clamps in the form of cable lugs. The strand is first roughened with a coarse wire brush, and then coated with vaseline, and the contact surfaces of the clamp are similarly treated. When clamped up tightly the roughened surfaces penetrate the vaseline and make electrical contact, protected from the atmosphere by the vaseline. The finished joint is served with a coat of weather-resisting varnish.

The cost of such a job is very favourable, as shown by a comparison of the cost of copper and aluminium for the same equivalent area, which was £150 for bare, hard-drawn copper strand, against £95 for bare, hard-drawn aluminium strand. The cost of erection, insulators, brackets, &c., is the same for both systems.

## THE INTERNATIONAL ELECTROTECHNICAL COMMISSION

AT the Berlin meeting of the I.E.C., held in September, 1913, it was agreed that meetings of the (International) Special Committees should be held in Madrid towards the close of the present month. These Special Committees deal with symbols, standardisation rules for electrical machinery, nomenclature, and prime movers for electrical plant. It has, however, been found impracticable to hold these meetings at the present time, and they have, therefore, been postponed until the autumn. It is probable that they may take place in London. This extension of time will enable the National Committees to consider in detail the various proposals which will be discussed by the Special Committees, and it should have the additional advantage of thus simplifying the work of the delegates.

### An International Standard for Copper.

The Commission has now published its proposals for an international standard resistance for copper. Hitherto there has been a slight lack of uniformity in the values adopted in the different countries as the standard for annealed copper, sufficient to prevent the various national tables for copper wires being entirely comparable. These differences arose in the main from varying interpretations of Matthiessen's original work for the British Association Electrical Standards Committee, published in 1864. In order to help forward the establishment of an international standard, an investigation was carried out by the Bureau of Standards of Washington at the request of the American Standards Committee, and in May, 1912, certain definite propositions, based on the experiments carried out by the different National Laboratories, were considered by a Special Committee of the I.E.C. then sitting in Paris. These propositions were subsequently circulated to the National Committees of the I.E.C., and at Zurich, in January, 1913, they were agreed to in principle; Dr. Glazebrook, C.B., and Prof. Janet (of Paris) kindly undertaking to prepare the final wording of the different clauses in consultation with the Bureau of Standards of Washington and the Reichsanstalt of Berlin. The Report was ratified at the Plenary Meeting of the I.E.C. held in Berlin in September last, at which twenty-four nations were represented.

The resistance of a standard annealed copper wire of 1 sq. mm. section is given as 0.017241 ohm at 20° C.; the temperature-coefficient is given as 0.00393 per degree C., and the density as 8.89 grammes per c.c. Commercial copper is to have its conductivity expressed as a percentage at 20° C. of that of standard annealed copper. These data are given in various convenient forms with other information in the Report, which is English and French, and can be obtained from the General Secretary of the I.E.C., 28 Victoria Street, Westminster, S.W., for 2s. 1d., post free.

**A New Galvanometer.**—A new type of thermogalvanometer was described by Mr. F. W. Jordan in a Paper read recently before the Physical Society. The puff of air from an orifice in an air chamber when the air within is suddenly heated is utilised in this instrument to deflect a small suspended vane. The current to be measured is made or broken through a heater of small thermal capacity in the air chamber, and the outrush or inrush of air through the orifice delivers an impulse to the vane. The disturbing effects of extraneous heat and pulsations of external pressure are eliminated by a compensation method. In one instrument of this type the sensibility was 4 mm. per microwatt and the extremity of the throw of the vane was attained in 2 seconds.

**Home Office Prosecution.**—Last week, at South Shields, Messrs. Pyman, Bell & Co. were charged under the Factory Acts with contravention of the electrical regulations in having failed to cover certain overhead wires with insulating material or to safeguard them to prevent danger. The wires in question were supported 22 ft. from the ground on wooden poles across a yard used for storing pit props, and fed electrically-driven saws used for cutting the props to length. The case arose out of the death by electric shock of a man named Beck, who came in contact with these wires when working on the top of a stack of props 17 ft. high, the wires having sagged down somewhat. The facts were admitted, and a fine of £5 and costs were imposed.

**Northampton College Magazine.**—The April issue of the magazine of the Northampton Engineering College Day Students Union Society contains an article on theories of corrosion of iron and steel, and an interesting contribution on "Modern Aspects of Electricity and Matter," by Mr. A. C. Jolley. Abstracts of papers and lectures before the College Engineering Society are also given, and various humorous and other items complete a bright little publication.

## FREQUENCY CHANGING BY STATIC TRANSFORMERS

**I**N a Paper read yesterday before the Birmingham section of the Institution of Electrical Engineers, Mr. A. M. Taylor described a method which he has developed for obtaining currents at a higher frequency than that of the supply by the use of static transformers only. His Paper opened by referring to work done in the same direction by Joly, Vallauri, and Spinelli, the first two of which inventors convert a single-phase supply into one of triple or double its frequency respectively, while the last gives a single-phase triple-frequency current from a single-phase supply. All these methods depend in some way on distorting the supply wave away from the true sine form by utilising the difference in the behaviour of magnetically-saturated and unsaturated cores of the transformers forming different parts of the apparatus.

Mr. Taylor's method, however, converts from three-phase to single-phase. The principle on which it works will be understood from Fig. 1, which is drawn for one phase of the system only. The primary current is passed through a winding on a choking coil, *ED*, with a saturated core, which gives it the form shown in the curve *C*. This is passed through an unsaturated transformer, in which the flux responds to the distorted current wave, and in consequence two impulses of back E.M.F. are generated, one at the commencement and end of each half cycle of the fundamental electromotive force, thereby absorbing part of the fundamental electromotive force received from the mains at the instant, and pro-

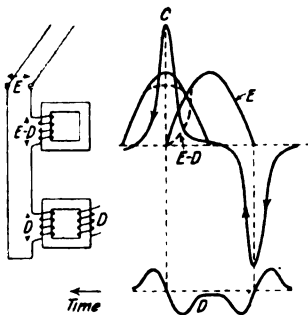


FIG. 1.

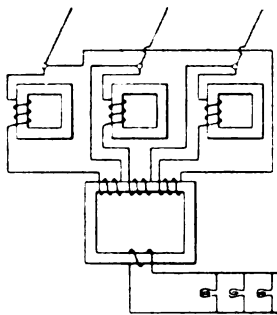


FIG. 2.

ducing in its secondary an E.M.F. wave of partially complete triple frequency, as shown at *D*. By the use of all the three phases in this way the incomplete half waves of the three cycles come in rotation, so that their effect cancels out, and a symmetrical triple frequency wave is the result. In combining the three phases, the three saturated choking coils have separate cores, and are mesh-connected, but the unsaturated transformer has a single core carrying all the primaries and the single secondary, as shown in Fig. 2.

The Paper gives dimensions of a 28-kw. set under construction, and from experiments on a 7-kw. apparatus it is estimated that the efficiency of a 28-kw. set will be 86-88 per cent.; of a 100-kw. set, over 90 per cent., and of a 500-kw. set, 95 per cent. The 7-kw. apparatus was found to have a voltage regulation within 8 per cent.

The author looks forward to a field for the apparatus in competition with rotary-converter substations with three-phase low-frequency supply and single-phase two-wire distribution at a voltage and frequency suitable for lighting, and for enabling lighting to be taken conveniently from 25-cycle three-phase high-tension power-supply circuits. He also anticipates advantages for electric welding and metallurgical work, as any load may be put on the secondary without disturbing the balance of the three-phase supply. Again, in the case of a three-phase 16-cycle supply for railway work, current could be obtained at 48 cycles for station lighting. With slight modification, the apparatus could be made reversible, so that an existing 50-cycle system could give a supply at 16.6 cycles for special purposes. Another field in which the author suggests is wireless telegraphy. With a nine-phase supply from special machines, and nine choking coils with one working transformer, a nine-fold increase of frequency could be obtained, and the method could even be extended to give a 27-fold step-up in frequency.

## RAILWAY CARRIAGE LIGHTING

**A**T a recent meeting of the Illuminating Engineering Society there was a discussion on the Lighting of Railway Carriages and other Public Vehicles. In his opening remarks Mr. E. Kilburn Scott referred to the improvements effected in design and construction of metal filament traction lamps. On most underground railways they were now used—five 100-volt lamps in series. For steam train lighting the pressure was only 22 volts, so that lamps with thicker filaments were possible. The 10-c.p. lamps generally used had an efficiency of 1.3 watts per c.p., and had an average life of about 900 hours, i.e., until the candle-power fell to 20 per cent. of the original. When only a single source of light was used, some passengers received light from an inconvenient angle, so that it was better to have several lamps dotted over the roof, which should be of a dull white. Reflected light was better for reading by, as the rays did not strike the paper at such an oblique angle, and unless the lights were shielded the source of light was directly in the eyes of a person looking upwards, as when lost in thought. The semi-indirect system appeared suitable. For reading alone wall brackets and lamps shaded by concave reflectors were best, but unless some roof lighting was also employed the upper part of the carriage appeared dark. Indirect cornice lighting with tubular lamps might also be adopted—he believed the system was already in use on some Great Northern trains. It would be advantageous as regards lighting to have all carriage work unpolished, and both woodwork and upholstery somewhat lighter in colour than was the present practice in this country, and the ceiling matt white. Mr. Scott then referred to experiments which had been made in various countries as to lighting, and instanced a case in which the energy consumption was reduced from 1.62 to 1.31 watts per sq. ft., at the same time increasing the reading illumination from 2.71 to 3.24 ft.-candles by the use of appropriate reflectors and lamps of slightly higher power spaced further apart. It would appear that there was now little difficulty in obtaining a minimum of 2 ft.-candles 30 in. above the floor.

Mr. J. S. Dow mentioned that he thought that it was best to measure the illumination on a horizontal plane at the level of the knees of the passenger, as this served well for different kinds of carriages. He showed slides of different kinds of lighting in use at the present time, and summarised the question by saying that in railway carriages considered by railway engineers to be well lighted 1 ft.-candle at the level of the knees of the passenger would probably give nearly two ft.-candles when a newspaper was held in an ordinary position in front of the eyes. This was more or less the figure obtained nowadays, and was not far from the Library and School Committee's figures. For the lighting of electric railway carriages the illumination obtained in recent years was between 3 and 4 ft.-candles. In the latest carriages on the District Railway it was 7. The filaments, however, were not in many cases sufficiently screened. Professor J. T. Morris (East London College) thought that lamps should be three-quarters frosted or else suitable shades used. He believed that an illumination of about 3 ft.-candles was the best; 7 was too high. Mr. R. A. Ives then illustrated some fittings for vehicle lighting. Mr. V. A. H. Mackinney said that there was not sufficient height for semi-indirect and indirect lighting to be used. Mr. R. C. Bussell mentioned that people did not always want to read the moment they got into a public vehicle, and said that provision should be made for dimming the light. Mr. Leon Gaster said that electric lamps were now being properly spaced in omnibuses, and a good example was found on the Allen line. These buses had a very even illumination and no glare. The value was between 2½ and 3 ft.-candles. Mr. G. Campbell and Mr. E. Styles also spoke, and Mr. Kilburn Scott replied briefly. He said that the tendency to relieve the walls by means of good pictures was a step in the right direction, and should be encouraged. Properly illuminated advertisements were also a relief to the eye.

**Electric Driving of Textile Machinery.**—Mr. J. F. Crowley gave a lecture on this subject last week at Galashiels to an audience of Border woollen manufacturers, mill engineers, and others. He emphasised the advantages of electrical driving in doing away with quantities of shafting and permitting more economical transmission and arrangement of machinery under steadier speed, enabling increased output to be obtained. He discussed the relative merits of group and individual drive. Although he did not recommend individual driving for every department of a mill, he put a strong case for individual loom drive, and claimed that the production of a weaving shed could be increased as much as 50 per cent. by their adoption. He spoke of a case at Bolton, where the electrical equipment had paid for itself in nine months by increased production.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,389.

In a tramway station using three negative boosters connected at three different points of a common continuous rail return, and with no other connection to the rail, the station being some 2,000 yards from the tram track, the earth plates are fixed at the station; does this violate the B.O.T. Rules? If one of the boosters was connected with the wrong polarity, instead of sucking, what would happen? If one of the boosters broke down would it be advisable to cut it out and short across, bearing in mind the long length of return cable, over 2,000 yards,

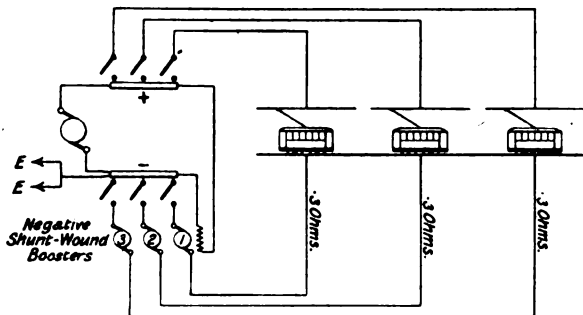


Fig. 1.

and that the negative bar is earthed at the station? Is there any necessity to fit any protective device to protect the booster in the event of the circuit-breaker on the motor circuit acting and cutting out the motor, bearing in mind that the boosters are plain shunt wound and separately excited off the traction bus-bars? On what basis would you regulate the pressures of the three boosters? The ohmic resistance of the negative returns are all about equal, and are connected to one continuous rail.—"ELECTROLYSIS."

(Replies must be received not later than first post, Thursday, May 14th.)

### ANSWER TO No. 1,387.

The primaries of three single-phase transformers are connected up in mesh, and are supplied by a three-phase system. The secondaries, also connected up in mesh, feed a balanced, three-phase, non-inductive load. One primary phase is open circuited on account of an internal breakdown other than a short circuit. What must I do to maintain the supply, and what changes take place in the currents in each of the windings and in the currents in the live wires, assuming the load to remain unaltered?

The first award is given to "A.G.E." for the following reply:—

Should one of the phase windings of the primary become open circuited, practically no interference will take place in the supply, as the other two transformers will make up between them the deficiency by taking the rest of the load which was originally being supplied by the faulty transformer, themselves. For this reason it has been found advantageous in practice to use the delta connection, thus minimising the risk of a shut

down due to an open-circuited transformer. The chief trouble experienced when the V connection is used is that the impedance of the transformers produces an unbalancing of the primary currents and secondary voltages. As a result of one phase being open the other two phases will take an increased current of approximately  $\sqrt{3}$  times what they would take under normal

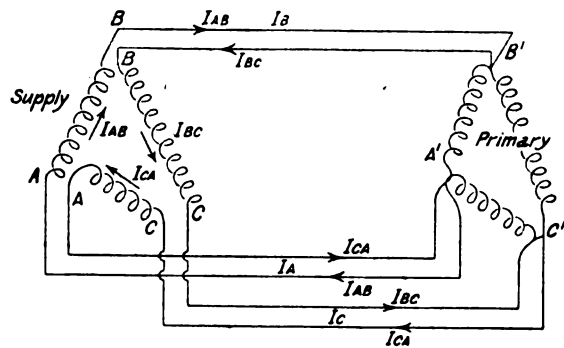


Fig. 2.

circumstances. That is if they took 100 amps. before the development of the fault they will now take somewhere near 173. This, of course, will mean a greatly increased copper loss per phase, and an overloading of the transformer if it had been working previously at near about its full capacity. The copper losses of one transformer will now be  $\frac{R(\sqrt{3})^2}{R \times 1^2}$  i.e., three times what it was before the fault occurred, and the total copper loss will be as 6 is to 3.

This increased copper loss will cause a reduction in the secondary voltages, and will necessitate a slight increase in the supply voltage if the secondary volts are to remain the same.

Transformers that are intended for use in such an emergency should have a combined rating of about 25 per cent. more than would otherwise be required.

To show the effect an open-circuited phase has on the system, I think the easiest way will be to consider what takes place in each phase of the supply separately. Imagine, therefore, three circuits which are as shown in the diagram AB, A'B', B'C', BC, and AC, A'C', and let V be the supply voltage, and  $I_{AB}$ ,  $I_{BC}$ , and  $I_{CA}$  the currents in the windings.

It will be seen by reference to Fig. 2 that you have current  $I_{AB}$  and  $I_{BC}$  flowing along the wires from BB to B'. Now imagine instead of two feeders from BB, CC, and &c., to B and C, one feeder in which precisely the same currents are flowing as you had before.

You then get the following relations, i.e.:—

$$I_A = I_{CA} - I_{AB}, \quad I_B = I_{AB} - I_{BC}, \quad I_C = I_{BC} - I_{CA}.$$

Now since BC is supplying B'A' and A'C' you will get a phase current less than you would otherwise get, since you have increased resistance losses. The result will be that the current flowing in two of the feeders will be somewhat less than  $\sqrt{3}$  times the phase current, as will be seen in the accompanying diagram. As a result of this you will unbalance to some extent the supply volts. A similar action takes place in the secondary circuit of the transformers producing an unbalancing of the voltages, and also the phase relationship.

The second award (5s.) is made to "A.G.R.," who writes as follows:—

In order to maintain continuity of supply the first thing to be done in such a case is to disconnect the faulty transformer. The remaining transformers will now be in V or open-delta con-

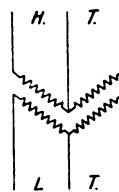


Fig. 3.

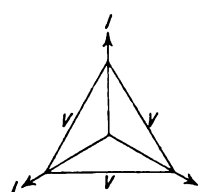


Fig. 4.

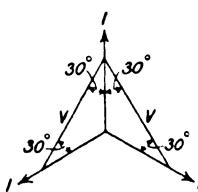


Fig. 5.

nection, as shown in Fig. 3. This arrangement will maintain the supply as before, and the line currents will be of approximately the same values (see below), as with the three transformers connected in delta. Fig. 4 shows the vector diagram for the



three transformers originally in delta, and Fig. 5 that for the two remaining transformers in  $V$ . By using different scales these diagrams will do for the H.T. or L.T. sides.  $V$  denotes line voltage, and  $I$  line current in each case. The power factor of the circuit will remain practically as before, i.e., unity. As the load remains constant, each of the two transformers in  $V$  will be overloaded 50 per cent., as there are only two instead of three units, and there will also be an internal phase difference between voltage and currents of 30 degrees in each transformer, as seen in Fig. 3. Therefore the load on each transformer, compared with the original normal load when connected in delta, will be

$$\frac{1 + 0.5}{\cos 30^\circ} = \frac{1 + 0.5}{0.866} = 1.73.$$

that is, each transformer will be overloaded 73 per cent., or the currents in the windings will be 1.73 times the original amount.

If the transformers were loaded to full normal output when connected in delta it is highly improbable that they will carry this overload of 73 per cent. for more than half-an-hour without heating up considerably.

The current in the middle lead of a  $V$ -connected bank of transformers with equal voltages impressed on all three phases should be slightly more than the current in the outside leads, on account of the fact that the drop in voltage across the open phase is, of course, slightly greater than across the closed phases; this difference in voltage between open and closed phases increases with decrease in power-factor.

The effect of leaving the L.T. side of the third transformer in circuit, with the H.T. side open-circuited, would be to maintain the iron loss in this transformer without any work being done.

### ELECTRIC POWER AT A BREWERY

THE application of electric power to the brewing industry requires the consideration of many special problems which are complicated by the question of steam heating. Every brewery must have a steam-raising plant for the supply of steam to heat the hot liquor tanks, and for grain drying. Indeed, the amount of steam required per hour is a dominating factor in the work of electrification. An interesting example is presented by the case of a large firm of Midland brewers who, finding the capacity of the old brewery insufficient, have made considerable extensions in the form of a complete new brewery, now nearing completion, to work in conjunction with the old. The old brewery possesses a small generating station, containing two gas engines driving bipolar continuous-current generators through belts. In addition, there is a small sub-station containing another gas engine and belt-driven bipolar continuous-current generator, with a combined full load capacity of 80 kw. at 230 volts, which is taxed to its utmost in the winter months. The new generating station is situated at the new brewery at about 300 yds. away from the old one, in a self-contained building, and

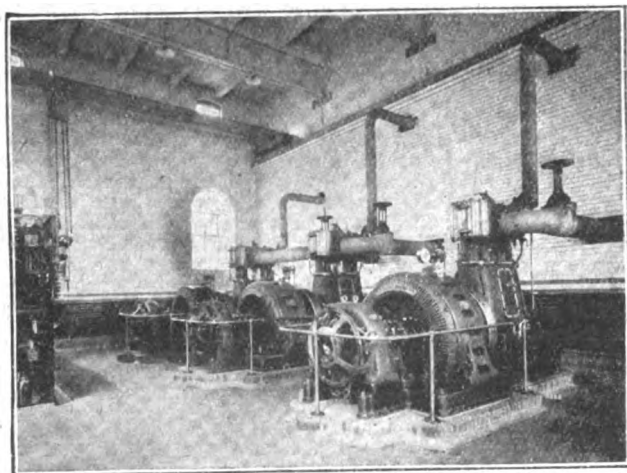


FIG. 1.—VIEW OF ENGINE ROOM.

generates sufficient power for both old and new breweries. Alternating current has therefore been adopted, and the general features of the generating station are as follows:—The engine-room, of which a view is given in Fig. 1, contains three compound steam-driven three-phase 400-volt Witton alternators of 200 kw. each, running at 428 r.p.m.; provision is also made in the station for the installation of an additional 500-kw. set. The main switchboard (Fig. 2) consists of three generator panels, six feeder panels, a voltage-regulator panel, and a spare generator panel. A constant bus-bar voltage is obtained by a voltage regulator. The lighting service is taken

from each phase and neutral at 230 volts. The boiler-house is equipped with three Babcock & Wilcox water-tube boilers, giving over 10,000 lb. of steam per hour. Dry saturated steam is supplied to the engines at 260 lb. per sq. in. From the engine the steam is exhausted into a super-heater passing on to the steam heating main. In order to maintain the purity of the steam for heating purposes, the engines have been designed to work without cylinder lubrication. The boilers are fitted with chain grate stokers, fed by an elevator and conveyor from a bunker at the end of the boiler-house. The stokers are driven through a worm-reduction gear by a 5-h.p. three-phase motor.

The feed-water is handled by two three-throw single-acting 25-h.p. motor-driven plunger pumps, the motors being designed to operate at two speeds. After being drawn from a softening tank, the water is pumped through an economiser, the scrapers of which are driven by a 3-h.p. motor. Coal is brought in trucks along a railway siding to the bunkers. After being elevated it is automatically weighed, and passes along by means of a scraper conveyor to the hoppers. The elevator, weighing machine, and conveyor are driven by a 12-h.p. pipe-ventilated motor situated above, and controlled from the floor.

The exhaust steam from the engines is conveyed along a long range of overhead piping, with special expansion bends supported on a gantry, which also carries the beer pipes from the old to the new breweries, a waste water-pipe, as well as water-supply for the fire hydrant and the feeder-

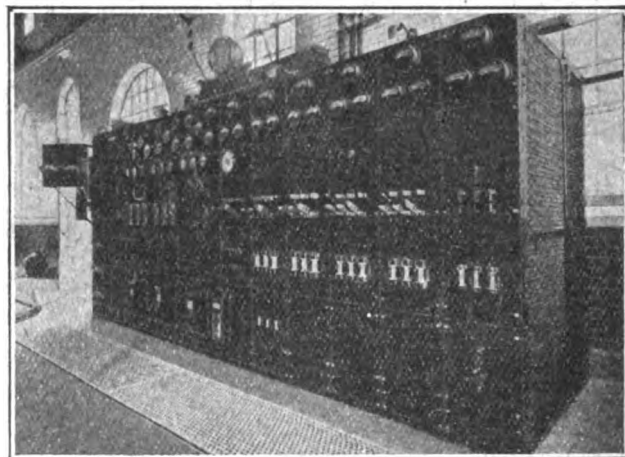


FIG. 2.—MAIN SWITCHBOARD.

cables. There is, in addition, a gangway running the whole length. This gantry will also be fitted with a scraper-conveyor to convey the coal from the dump about half-way along the range. This coal will be shovelled from the coal stores on to a sunken band conveyor, and carried to the foot of the gantry, where it will be elevated and conveyed along the top to the boiler-house, into a bunker, and then handled by the boiler-house conveying plant, the actual firing of the boilers being done with a minimum of labour.

For the internal wiring of the power-house, energy is brought from a feeder-panel from the main switchboard by three-core rubber-insulated cable laid under the engine-room floor in earthenware pipes. The power distribution board, which is one of the G.E.C. stepped pattern, is placed above the lighting distribution board, and away from the wall, so as to allow the lighting cable to go behind it. One circuit on the power distribution board feeds the lighting board, and the neutral wire will be noticed branching off the main feeder. The whole arrangement is perfectly watertight. The station, which is lined with glazed bricks, is lighted by lamps fixed direct to the girders high up on the ceiling.

In brewing work, although alternating-current machinery is more suitable than continuous, it is at some disadvantage when the plant to be driven needs an adjustable speed, as in a fair number of places in a brewery, and several alternatives are available for obtaining it. In this instance, the adjustable speed work is grouped, and the plant driven by continuous-current supplied by a motor-generator erected in the old power-house. This machine has a capacity of 105-kw. at 250-volts, and is capable of driving all the continuous-current plant required. The whole of the electrical plant for this scheme has been supplied and installed by the General Electric Co., Ltd., of Witton Works, Birmingham, and 67 Queen Victoria Street, London, E.C.

## DIESEL ENGINE USERS ASSOCIATION DINNER

THE first annual dinner of this Association was held at the Trocadero on Thursday, under the Presidency of Mr. J. E. Edgcome (Chief Electrical Engineer to the Kingston-on-Thames Corporation). The formation of the Association, something less than a year ago, arose out of a suggestion that users of Diesel engines might with advantage hold occasional formal meetings in order to discuss practical points and difficulties arising in the course of their work, but the idea has developed into something rather larger. At present the membership consists almost entirely of chief engineers of electrical power-stations in which Diesel engines are at work, but the rules permit of the admission of chief engineers of any works on which these prime movers have been adopted. To the Kingston-on-Thames Electricity Department belongs the honour of having installed the first horizontal Diesel engines in this country, and perhaps to that fact may be attributed the selection of Mr. J. E. Edgcome as the first President. (The engines were described in *ELECTRICAL ENGINEERING* for October 2nd, 1913, p. 552.) The long distances which separate Diesel engine users was responsible for there being a preponderance of guests at the dinner. These, however, were mainly manufacturers' representatives, upon whom the point was pressed that the Diesel Engine Users Association is not, as was on one occasion suggested, a body formed to secure better terms from manufacturers, and by the remarks of Mr. H. S. Russell (Messrs. Mirrlees, Bickerton & Day), Mr. G. Heath (Consolidated Diesel Engine Manufacturers, Ltd.), and Mr. J. M. Ferguson, all of whom responded successively to the toast of "The Guests," there would appear to be no misunderstanding between the makers and the Association on this point. On the other hand, whilst manufacturers are not eligible for membership, they are assured that their interests are well looked after by the respective users, who constitute themselves champions of the particular type they happen to adopt. Mr. Edgcome, in replying to the toast of the Association, called attention to the surprising ignorance regarding the possibilities of Diesel engines, not only in the lay mind, but in the minds of engineers. Many seemed to think, he said, that this engine is of quite recent manufacture, whereas the first experimental engine was built in this country twenty-one years ago. In England there are 450 engines, with a total horse-power of 86,000, whilst in other parts of the world there are 4,050 engines, with a horse-power of approximately 700,000. The chief cause of the retardation of the use of Diesel engines was the abnormally high price of fuel oil. The impossibility of obtaining gas tar oil of a uniform quality was also a deterrent to the increase in the use of Diesel engines, and these two points were matters which would be taken in hand by the Association. The very successful evening which was spent was admirably organised by the Hon. Sec., Mr. W. E. Brandreth, Chief Engineer to the Wycombe (Borough) Electric Light & Power Co.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A Paper outlining the present state of wireless telegraphy, by Mr. H. Fothergill, was read on April 23rd before the North-East Coast Institution of Engineers and Shipbuilders at Newcastle. After explaining the general nature of damped and undamped trains of waves, the author described the damped wave-spark system as used in Marconi stations employing the rotary disc discharger; in which the generating, oscillation, and radiating circuits are coupled to one another by transformers, and the discharger forms a shunt across the oscillatory circuit. The Telefunken system is generally similar, except that multi-gap plate discharger with no moving parts, giving a quenched spark, is used. The main object of both these dischargers is to cut off the spark immediately the energy in the oscillating circuit is first absorbed by the radiating circuit, and to prevent further useless surgings of energy in the former, while allowing the oscillations to continue in the tuned radiating circuit. Passing on to the generating of undamped or continuous oscillations, the Goldschmidt system, in which a high-frequency cascade alternator is used, and the Poulsen system, with its "singing" arc, were described. The relative merits of undamped and continuous waves were discussed, and it was mentioned that

the latter had so far only been employed for long-distance work experimentally. Turning to the reception of the waves, the Marconi magnetic detector, and the crystal detectors used in inductively-coupled circuits in the Telefunken and other systems were described. The Marconi Co. also use crystal detectors to some extent, and couple the receiving and detector circuits by an intermediate tuned circuit embodied in their "multiple tuner," which obtains good immunity from the effect of interfering waves. Some notes were then given on the British Imperial Wireless chain of stations. These will have duplicate plant, will employ waves from 15,000 to 50,000 ft. in length, and will contain plant aggregating from 1,900 to 2,500 h.p. The transmitting and receiving stations will be not less than ten miles apart in each case, and will be provided with balanced aërials to avoid interference. The transmitting stations will be operated so far as the actual sending of signals is concerned from the receiving stations by remote control. Short descriptions were given of typical maritime and military stations, and in conclusion the author said that the following were among the many problems still remaining to be solved:—Why is it that when using short waves, the distances covered at night are usually very much greater than those traversed in the daytime; whilst when using much longer waves the range of transmission by day and night is about equal, or sometimes even greater by day? What explanation can be given of the fact that the night distances obtainable in a north-southerly direction are so much greater than those which can be effected in an east-westerly one? Why is it that mountains and land generally should so greatly obstruct the propagation of short waves when sunlight is present, and not during the hours of darkness? These questions will no doubt be answered correctly after further investigations have been made, but at the present time it is doubtful if any of the many theories put forward are correct explanations.

It is stated that an entirely new scheme of telephone charges is under consideration by the Postmaster-General, together with other reforms, including an extension of the Metropolitan area, cheaper trunk calls, &c. It is understood that the distinctions between trunk and junction calls are to be rearranged on a more equitable basis. The details of the scheme will shortly be made public, and will be submitted to the various Telephone Advisory Committees before being finally put into force.

The *Evening News* is giving its assistance gratuitously to the Post Office to assist in improving the London Telephone Service, and from the announcement which it has published its services have been accepted. The scheme has been to ask all its readers during the week to send in specific complaints as to bad service, with full details. Our contemporary has recently been publishing a series of articles, evidently inspired by the Post Office, to demonstrate that a very large proportion of the bad service is due to the subscribers' own fault.

Successful experimental wireless communication is reported between Johannesburg and Durban, and from the Rand to ships at sea at a distance of 1,500 miles.

A site for a new Post Office wireless station has been chosen about three miles south of Stonehaven.

At the meeting of the Direct United States Cable Co., Ltd., it was stated that the Company's main cable had been interrupted twice in deep water since the lease was entered into with the Western Union Co., and they had inserted 425 miles of improved cable. Consequently, owing to the depletion of the reserve fund, the bonus would be withheld.

The Cayenne-Salinas cable of the French Co. was down again on the 22nd inst., and restored on the 24th inst.—On the former date telegrams for Vera Cruz were subject to delay, and were only accepted at sender's risk.—The Bagdad-Bassorah line failed on the 23rd, and was repaired on the 25th.—Albania now again admits private telegrams in code and cypher.—The Western Telegraph Co. published rates to Mexico, and are able to accept messages *via* Valparaiso at the rate to the Argentine Republic plus four francs a word for transmission beyond.—Rates were also published by the Emden route, but owing to the interruption of landlines near the Isthmus, telegrams can only be accepted at sender's risk by either route.—It is also possible to send telegrams by the Transatlantic cables and Panama.—Owing to censorship at Vera Cruz messages for British Honduras must be written in plain English or Spanish, and the contents must be rigorously neutral to Mexican interests.—The line between Coatzacoalcas and Tehuantepec being down, messages for Salina Cruz must be sent *via* Panama.—There is also delay in messages for Mexico *via* Galveston, and since the 27th inst. messages cannot be sent to British Honduras, no doubt owing to the interruption of landlines.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published April 23rd, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

**7,245/13. Semi-indirect Fittings.** H. WADE (*Schneider & Nautjoks Elektricitäts Ges.*). A single lamp reflector fitting is described in which the lamp is placed within an upper opalescent inverted bowl reflector, while under it is a glass bottom, the bowl-shaped middle portion of which, under the lamp, is opaque or opalescent, while the outer portion is of clear glass to transmit the light reflected downwards by the upper reflector. One figure.

**7,842/13. Loom Driving.** SIEMENS-SCHUCKERTWERKE GES. In this method of driving looms by electric motors, mechanical balancing, buffering or energy-storing devices are employed. These absorb energy twice during each revolution of the main loom shaft to retard the loom at those portions of the cycle of operations when the loom masses tend to overrun the motor. Six figures.

**8,124/13. Incandescent Lamps.** E. P. BECKWITH. In order to prevent heat losses, the filament supports are covered with a special non-conducting composition.

**13,063/13. Electric Irons.** F. S. RIPPINGILLE. The heating element in these irons consists of a tubular incandescent lamp in an ordinary holder screwed, by the thread which normally holds the shade ring, into a cavity so that the lamp is entirely within the body of the iron. One figure.

**14,170/13. Semi-indirect Lighting Fitting.** O. D. LUCAS and VERITYS, LTD. The large inverted reflector for the indirect portion of the lighting has a hole in its centre through which passes the neck of a single extra lamp used for the direct illumination, and this is surrounded by a small opalescent bowl attached to the main reflector. All the lamps are mounted on a fitting attached by a rigid rod to the ceiling, and the whole reflector system is hung on a counterweight arrangement so that it can be lowered clear of the lamps for cleaning. Four figures.

**14,941/13. Ventilating Electrical Machinery.** BROWN-BOVERI ET CIE. In this system of cooling turbo-alternators and similar machinery, longitudinal and radial ducts in the rotor co-operate with radial ducts in the stator, the latter being so divided that an air-stream can flow from rotor ducts to one division, and a further stream from the outer stator periphery to another division. Two figures.

**15,318/13. Lamp-holders.** G. ST. J. DAY. In this lamp-holder the contact plungers are not connected to the rest of the circuit until the lamp is pushed home, so that they cannot be live when there is no lamp in the holder. Five figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** A.E.G. [Lowering and braking connections for D.C. cranes] 5,529/13; DEBAUGE [Apparatus for manufacture of lead cable casings, &c.] 5,230/14.

**Dynamos, Motors, and Transformers:** WEINTRAUB [Vapour rectifiers] 6,353/14.

**Electrometallurgy and Electrochemistry:** HADDAN (*Internat. Ionizing Process Co.*) [Production of gases by means of arcs] 8,033/13; BREYDEL [Treatment of liquids with nascent ozone] 8,772/13; CANNING [Electro-plating] 17,603/13; SOC. GÉNÉRALE DES NITRURES [Aluminium nitride] 21,366/13.

**Ignition:** SPADA [Spark plug] 29,059/13.

**Incandescent Lamps:** BECKWITH, 8,123/13; WESTINGHOUSE METALLFADEN GLÜHLAMPENFABRIK GES. [Rendering metals and alloys ductile and malleable] 11,017/13.

**Instruments and Meters:** CIE. INTERNAT. D'ELECTRICITÉ SOC. ANON. [Meters] 11,825/13; SIEMENS DYNAMO WORKS (*Siemens-Schuckertwerke Ges.*) [Transformers] 2,492/14.

**Switchgear, Fuses, and Fittings:** R. BOSCH [Container of pressure regulated granular resistance] 28,824/13; LUNDBERG and PEGG [Switches] 29,721/13.

**Telephony and Telegraphy:** WESTERN ELEC. CO. (*Western Elec. Co., U.S.A.*) [Machine telephone switching] 5,653/13, 895/14, and 5,510/14; REBESI and HOLDEN [Telephone call apparatus] 8,412/13; HARRISON and AUTO. TELEPHONE MFG. CO., 26,479/13; WIDEGREN [Writing telegraphs] 29,242/13; SIEMENS & HALSKE [Telephony] 2,211/14.

**Traction:** MARKS (*Mascarenhas*) [Signalling and train control] 8,249/13.

**Miscellaneous:** GRAHAM and RICKETS [Order telegraphs] 5,648/13; MAY [Increasing strength of magnets] 7,898/13; CHADBURN'S (SHIP) TELEGR. CO. and HOWIE [Speed indicators] 7,994/13; LIGHT [Hosepipes for fire alarm installations] 9,396/13; THOMPSON and DAVIES [Magnetic separators] 9,725/13; CORSI [Jacquard machines] 10,373/13; CAMINATI [Thermoelectric current consumption-regulator] 17,947/13; HAY and SULLIVAN [Resistances] 21,109/13; BLOXAM (*R. Bosch*) [Condensers] 28,823/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** GIRARDEAU [Auto-regulation] 7,451/14; BLONDEL [Lighting by synchronised intermittent arc] 7,921/14.

**Distributing Systems, &c.:** SIGNAL GES. [Sub-aqueous electrical driving of machines using or generating hydraulic pressure] 7,821/14; DESPESAILLES [Lighting installations] 7,938/14.

**Dynamos, Motors and Transformers:** SIEMENS-SCHUCKERTWERKE GES. [Diminishing air friction of flywheel machines] 7,868/14; [Polyphase commutator machines] 8,258/14; SCHERBIUS [Transformers] 7,932/14.

**Electrometallurgy and Electrochemistry:** A. E. G. [Welding] 8,595/14.

**Ignition:** SPADA [Sparking plugs] 2,499/14

**Switchgear, Fuses and Fittings:** WEISSMANN [Tubular support for luminous signs] 7,311/14; HART [Switches] 8,038/14; MAX MATTHAEY & CO., GES [Plug connectors] 8,349/14; DRESLA [Time switches] 8,504/14.

**Telephony and Telegraphy:** CIE. FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON [Telephones] 5,640/14; KEMP and LAURITZEN [Transforming alternating currents into sound waves by resonators tuned to different frequencies] 8,021/14; COMER [Transmitters] 8,049/14.

**Traction:** CIE DE SIGNAUX ELECTRIQUES POUR CHEMIN DE FER [Signal control] 8,369/14 and 8,370/14.

**Miscellaneous:** HOLWERK [Cathodic detectors] 2,206/14; QUARZLAMPEN GES. [Mercury joint packing for vacuum vessels] 6,118/14; BENDEL GUSTAV [Soldering aluminium] 7,928/14.

The following Amended Specifications may now be obtained:—

**Ignition:** H. G. & W. W. LONGFORD and W. H. CLARK [Plugs] 20,207/11.

**Traction:** INTERNATIONAL P.A.Y.E. TRAMCAR CO. [Tramcars] 21,710.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

8,208 of May 3rd, 1900. **High-Pressure Switchgear.** B. T.-H. CO. (*E. M. Hewlett, U.S.A.*). The switch contacts are immersed in oil in a fireproof chamber. The bridging piece is worked by oil-pressure from a motor situated on the top of the chamber, and whose valves are controlled electro-magnetically. A long break is obtained and the fixed and movable contacts may be readily disconnected from the leads. When the contacts have been bridged the controlling magnet has a resistance cut into its circuit by the action of the switch.

8,274 of May 4th, 1900. **Blasting and Mining Fuses.** H. J. HADDAN (*Fabrik E. Zünder, Germany*). A flat insulating strip has each side coated with a conductor and a small piece of primary material is stuck on one end so as to connect the two coatings. Fuses of this kind can be very cheaply manufactured in quantity. A method of transport is also described.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** G. M. LITTLE [Flame lamps] 66/08.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.-H. CO. and WEDMORE [Automatic switches for feeder protection, &c.] 634 & 634A/07.

**Dynamos, Motors and Transformers:** J. G. V. LANG [Motor controllers] 329/03; M. WALKER [Power factor regulators] 693/09 and 29,376/09.

**Storage Batteries:** LEITNER, H. [Stoppers for cells] 517/07.

**Switchgear, Fuses and Fittings:** G. WEISSMANN [Electric signs] 321/09.

**Telephony and Telegraphy:** F. RITCHIE [Writing telegraphs] 455/04.

**Traction:** J. P. DURKIN [Controller time lag appliance] 14,073/06; K. W. G. J. STOFFELS [Electrically-actuated tramway points] 383/07; B. G. LAMME [Locomotives with resilient gear-drive] 28,634/07.

**Miscellaneous:** B. J. B. MILLS (*International Curtis Steam Turbine Co.*) [Steam turbines] 756/02; METALLURGISKA PATENT-AKTIEBOLAGET [Magnetic separators] 210/07.

## ELECTRIC TRACTION NOTES

The Paper by Mr. H. W. Firth on "Electrification of Railways as affected by Traffic Considerations," read at last Thursday's meeting of the Institution of Electrical Engineers, concluded the series which has dealt with various aspects of electric traction. The author dwelt upon the much greater difficulties which exist in the working of the mixed traffic of a section of a large railway, as compared with a tube railway or similar line. It was difficult to reserve rolling-stock for one kind of service only, and for electric traction a greater flexibility of speed characteristics was desirable. The author considered that true main-line business could not be profitably electrified at present as a rule, and there were a number of points to consider in order to get the best results out of electric suburban working. Difficulties were introduced by the necessity of running empty trains of cars, and to get the best results it might be necessary to run practically all the traffic within a certain distance from the terminus electrically. Unless the tracks for main-line and suburban working could be kept separate there was difficulty in arranging the short signal sections necessary for rapid service, and there were great limitations of frequency due to effects of crossings, flat junctions, and arrangement of terminal approach roads and platforms. About thirty trains per hour seemed to be the limit where there were flat junctions against the fifty which the District Railway hope to attain shortly. Consequently very heavy trains would have to be run which, with electric traction, had a greater effect on the capital cost than had an increase in frequency of light trains. The length of station stops had great influence on the problem, and in his opinion side-door coaches allowed shorter stops than corridor stock. Some interesting traffic curves of the G.E. Railway were given, showing the magnitude of the peak of the load in the morning and evening rush hours. The curves showed a "daily passenger load-factor" of 22 per cent., and this tended to get worse, as road competition affected the non-rush-hour traffic more than the rush-hour traffic. He suggested that it might be economical to only install generating plant to take about two-thirds of the peak load, and to run the remainder of the peak traffic by steam. This matter was gone into at some length, and estimated costs were given to show that it was feasible. It was suggested that the non-stop portion of the traffic was the most suitable for running by steam in this way. A number of interesting traffic curves of various railways were shown to illustrate the nature of suburban traffic under various conditions.

Mr. Firth's paper was well received in the discussion, but Mr. Roger T. Smith (Electrical Engineer, Great Western Railway) did not like the author's use of the word load-factor, and suggested utility-factor as preferable. The ideal was certainly to have separate tracks for suburban and main-line traffic, and several railways were tending in that direction. The feasibility of dealing with the traffic peaks by steam traction depended upon the comparative costs of steam and electric working under these conditions, and he thought that Mr. Firth's figures for steam were rather low. There were instances where non-stop traffic was run by steam, and stopping-trains electrically on parallel tracks. Mr. H. E. O'Brien (Lancashire & Yorkshire Railway) said that the conditions of electric traction enabled more traffic to be attracted during the non-rush hours. The sandwiching of steam and electric trains was only practicable when different terminal platforms could be used. He preferred corridor to compartment coaches for several reasons. Mr. H. Burge (Crompton & Co.) referred to a system of booster control of traction motors which has been experimented with in France (ELECTRICAL ENGINEERING, March 12th, page 148) by which it is claimed that as much as 25 per cent. can be saved in energy consumption, with only a 3 per cent. increase in the weight of the train. Mr. Bowden (Metropolitan Railway) thought that the chief fault of Mr. Firth's paper was that it did not show as strong a case as it might for electrical traction. He also thought that the author's comparison of costs was unduly favourable to steam. Part of the time of enforced idleness of the rolling stock during non-rush hours could be utilised for cleaning and overhauling in the sheds. In the case of the Metropolitan and District Railways, it was by gradually eliminating the limitations due to junctions, &c., that the present frequency of service has been built up. The growth of suburban traffic made electrical working a necessity, and due to the acceleration and hill-climbing power available, it was particularly adapted to dealing with flying junctions. The hollow in the generating-station load curve should be filled up by goods traffic and shunting. Mr. W. M. Mordey made a few remarks on the advisability of adopting methods of control other than those used at present for economising energy consumption. Mr.

Drury (Great Eastern Railway) also spoke, and Mr. Firth in reply commented on some of the points raised in the discussion.

As announced in last week's ELECTRICAL ENGINEERING, the electrical working of the Earls' Court Willesden Section of the L. & N.W. Railway is to commence to-morrow. As the new rolling-stock for the purpose is not ready, the service will be started with cars belonging to the District Railway. Drivers have been in course of training on the District Railway for some time. A fifteen-minute service is to be given. Pending the completion of the Company's own generating station at Stonebridge Park, current will be obtained from the sub-stations of the Great Western and District Railways. Work is progressing rapidly on the other sections which are being electrically equipped.

An automatic ticket-issuing machine has recently being installed at Victoria Station by the Metropolitan District Railway Co. It was designed and patented by the British Electric Automatic Machines, Ltd. (115 Victoria Street, Westminster), and performs the operations of printing, numbering, dating, and cutting off, of the tickets. The machine, which is set in action by depressing suitable levers, will print any of five different kinds of tickets, and is big enough to deal with ten kinds if required. The driving power is obtained through a chain drive, from a 6-h.p. direct-current, series-wound, 200-volt motor, which in turn is fed from the direct-current mains, which have a voltage of about 550, through resistances. The motor is of ample power, so that when the starting lever is depressed, full speed is rapidly attained. Automatic counters are fitted, so that the exact number of any particular kind of ticket which have been sold can be readily seen. The introduction of this machine is significant of the tendency to eliminate as far as possible the human element.

The moving stairways at Oxford Circus Underground Station are to be opened on May 9th. These are the largest that have yet been constructed, and will displace the lifts. Each has a vertical rise of 54 ft. and length of 121 ft., and 300 passengers can be carried at once. Each is worked by a 60-h.p. motor, and the two together can transport about 27,000 passengers per hour.

The London County Council Tramways and Improvements Bill, which, among other things, seeks powers to construct a loop in connection with the present Aldgate tramway terminus along Mansell Street and round Trinity Square, has been before a Select Committee of the House of Commons. There is opposition from the Port of London Authority and the Trinity House, and the Corporation of the City. It is not intended that all the cars should go round the loop.

It has been decided by the Dundee Tramways Committee to discontinue the running of the trolley-omnibus service along the Clepington Road. It appears that the traffic on the route has not come up to expectations, and the cars are objected to by the residents. The road is badly in need of repair.

The Stirling Town Council have declined the offer of Balfour, Battie & Co. to purchase the electrical undertaking and convert the present horse tramways to electric traction, and are investigating a scheme by arrangement with the Bridge of Allan Council and the Stirling and Bridge of Allan Tramways to institute a system of electric tramways between Bridge of Allan and Bannockburn.

The annual report and accounts of the Belfast City Tramways records a gross profit of £111,948, of which net revenue charges absorbs £60,527, leaving £31,352 to be transferred to sinking fund, £17,000 to depreciation, and £3,066 to general purposes fund.

The Blackpool Corporation Tramways report considerable increase in traffic, and a surplus on the year's working of £24,532.

According to the *Standard*, the Ontario Legislature has voted £1,000,000 for the construction of a Government electric railway system.

**Obituary.**—The death of Mr. Danckwerts, K.C., removes a notable legal personality, who was by no means unknown in electrical circles. An important electrical case in which the late Mr. Danckwerts was engaged was the dispute between the Leicester Corporation and the Electrical Contractors' Association, when the latter was successful in compelling the Corporation to close down its wiring department which the Chancery Court held was being carried on illegally. Mr. Danckwerts on that occasion appeared for the Corporation. A more recent occasion on which he came into prominence in the electrical world was in the Telephone Arbitration, in which he was one of the counsel for the National Telephone Co.



## "ELECTRICAL ENGINEERING" TRADE SECTION

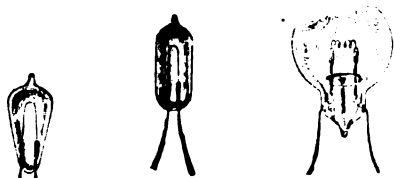
— Notes on Tenders Invited and Prospective Business appear on p. 247. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**LATHE TOOLS.**—A leaflet from the Motogear Engineering Co. (Brandon Grove, Ilford Hill, Essex), describes the "Eldrick" patent tool for parting off work in progress on the lathe, cutting tube, rod, &c. The tool is self-contained, and is fitted with a distance gauge, giving exact reproduction of length in repetition work.

**THE WEST HAM BULLETIN.**—The April issue of the West Ham Corporation Electric Service bi-annual Bulletin contains notes on the use of Edison battery delivery vans in the district, and an article on electric spot welding. Two cases are described where electric power has displaced steam driving on a large scale, and a further article describes electric furnaces for tool hardening and tempering.

**METAL FILAMENT LAMPS FOR MEDICAL PURPOSES, &c.**—The General Electric Co. (67 Queen Victoria Street, E.C.) have issued a new list of small size low-voltage Osram lamps suitable for various medical and scientific purposes, where they



have great advantages over carbon lamps on account of the smaller amount of heat produced. A number of standard patterns are listed, some of which are illustrated here, but the Company are always ready to quote for lamps made for special purposes.

**ELECTRIC HORNS.**—We have received from The Benjamin Electric Ltd. (1a Rosebery Avenue, London, E.C.), pamphlets describing the Dean Design Battery Horns and accessories. These horns are designed for both motor-car and motor-cycle use. The former operate on from 5 to 10 volts, the latter on from 4 to 6 volts. A five years' guarantee is issued with each horn. We understand that this type of horn has been made the standard equipment for the 1914 "Indian" motor-cycle.

### A NEW ELECTRIC COOKER

A NEW and very convenient form of electric cooker and stove, which is illustrated here, is being put on the market by Drake & Gorham, Ltd. The heating element consists of a glowing coil tube covered by a grid, and the apparatus reaches its full temperature in about fifteen seconds. It can

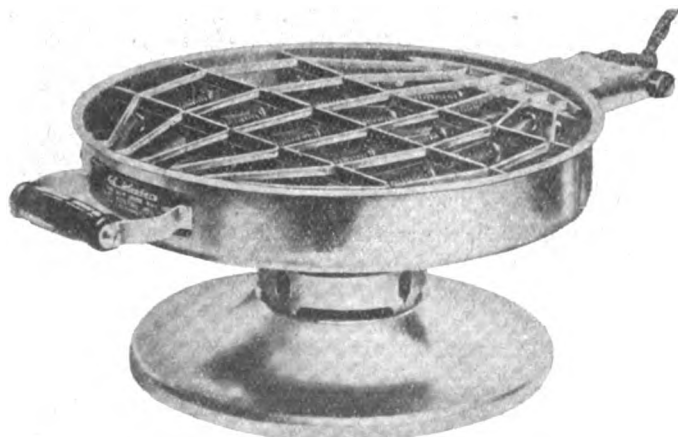


TABLE ELECTRIC COOKER AND STOVE.

be used as a toaster producing two slices in two minutes, or for heating frying pans, kettles, water-heaters, &c., or almost any ordinary utensil. The specially flat-bottomed vessels advisable with the disc type of boiling plate are not required.

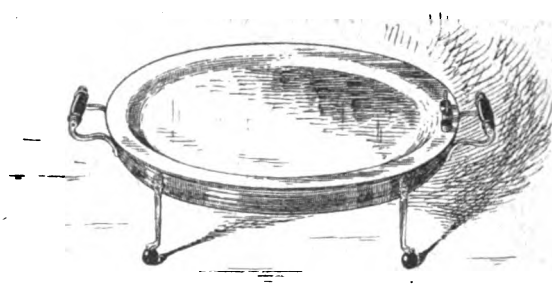
The current-consumption (600 watts) is so low that the apparatus can be connected to an ordinary lamp circuit, and a special feature is the burnished brass heat reflector within the pressed steel frame. The heater only weighs 2 lb., and the diameter of the top is 7½ in.

### A CONVECTION GRILLER

WE enjoyed our lunch last Thursday. It consisted of fried sole cooked on a 500-watt Venner convection griller, kidneys and bacon cooked on the same griller, asparagus steamed over a Venner electric oven, an omelette cooked on the same convection griller, bread and cheese straws made in the oven, and coffee from water boiled in a Venner kettle with immersion heater. All was excellent, and the sole, kidneys and bacon, and omelette were cooked in front of us in the small room in which we dined, and yet, remarkable to relate, there was no "smell of cooking."

The food on the griller was cooked directly on the top plate of the apparatus—without the interposition of any other cooking utensil, even for the omelette. It took five minutes to bring the griller up to heat, and to melt the fat for the sole to be cooked in, and a quarter of an hour more to cook the sole (an animal weighing 1¼ lb., and amply large enough for the three of us who were lunching). While we were eating the sole, the top plate was cleaned off, and the kidneys and bacon were then cooked in ten minutes, and the process was repeated with the omelette, which took five minutes only to prepare.

The griller is shown in the illustration below. It differs from other electric cooking utensils by heating the hot-plate



only by convection instead of by radiation. In consequence, the heat is absolutely uniform, and applied only where it is wanted. The apparatus stood on a polished wooden table, the surface of which was not even made perceptibly warm.

The heating coils are of nichrome wire wound on micanite strips, and they are immersed in a special oil with a flash point of about 670°F.; there is about ¼ in. of oil between the wire and the bottom of the plate, which is therefore heated by convection currents of hot oil. As seen in the illustration, the plate is about ½ in. deep, so that a dish is formed in which the things are cooked, and the plate is coated with a high oxide of iron which gives a hard blue-black surface easy to clean and always free from rust. There is only one pair of terminals, and the one heat is sufficient; owing to the small quantity of heat required to heat up the small volume of oil above the coils, the plate attains its high final temperature very quickly, and the absence of smell was explained to us as being due to the immediate contact between the food and the high temperature hot-plate which quickly seals the pores of the fish or meat, which retain the juices. The terminals are pins surrounded by an insulating compound retained in a metal collar, and the coefficient of expansion of the compound and the metal are the same, so that there may be no leakage of oil. A valve is provided next to the terminals to let off any vapour which may rise from the oil in the event of a severe short within the apparatus. The griller measures 13½ in. by 10½ in. We were also shown a smaller one, of circular shape, 9 in. in diameter, which takes about 400 watts.

The rating of the Venner oven is also extremely low for the work it does. In this the coils are not in oil, but are placed all round the oven (which is cylindrical) between a

black and bright metal plate. A steamer for vegetables fits on top of the oven. The oven takes 1,300 watts only, and a hot cupboard beneath it 150 watts. The oven itself is 15½ in. internal diameter and 20 in. high, and will take a 12-lb. joint.

The apparatus described is expected to be on the market in a few weeks' time; the manufacture has commenced. Mr. R. F. Venner and Mr. B. G. Battson, who is associated with him in the development of the apparatus, have had it in successful use in their own houses for two years, and have effected economies of 50 per cent. in the cost of cooking (in Mr. Battson's case at 2d. per unit), compared with the previous cost of gas cooking.

There is no doubt that the low voltage and easy applicability of the Venner cooking apparatus will recommend it to many of those central station men who have hitherto held back from developing electric cooking, owing to the limited size of their distributing mains.

A new company, Venner's Electrical Cooking & Heating Appliances, Ltd., has been formed for the supply of the apparatus, and has fitted a combined kitchen and dining-room at its offices in Walter House, at the corner of the Strand and Bedford Street. This is fitted with two ovens and three grillers, all placed on a glass-topped dresser.

### MOIST HEAT ELECTRIC FIRES

THE illustrations show an improved form of electric fire introduced by the Altheat Co., Ltd. (62 Oxford Street, London, W.). It is claimed that these fires give out a soft

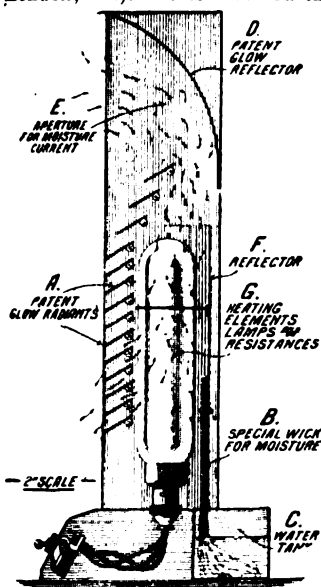


FIG. 1.—SECTION OF HEATER.

run at either half, three-quarter, or full load. Owing to the fact that the heat-absorbing and radiating power of moist air is many times greater than that of an equal amount of dry air, the heating effects of this type of stove are claimed to be

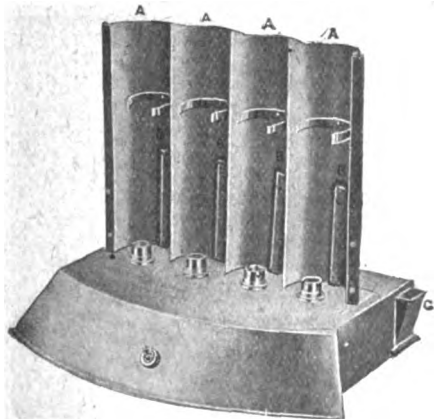
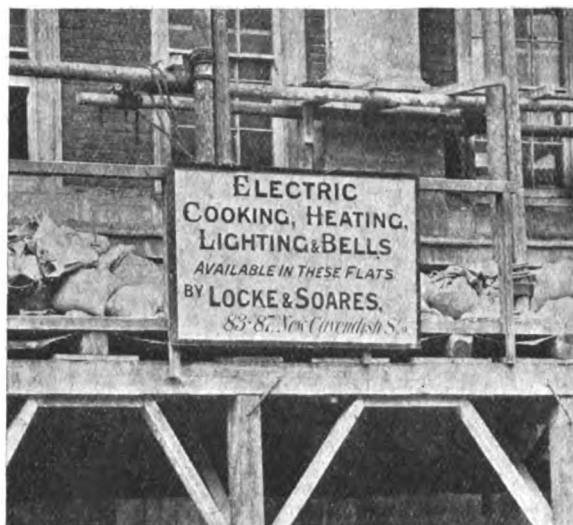


FIG. 2.—"FIALITE" STOVE WITH COVER REMOVED.

more marked than where stoves of the ordinary dry air type are used. The general finish of the Altheat electric fires is distinctly artistic. We are informed that the prices compare very favourably with those of other types.

### THE SPREAD OF ELECTRIC HEATING AND COOKING

WE reproduce here one of a pair of photographs which have been sent to us by Mr. A. H. Seabrook, General Manager, Borough of St. Marylebone Electric Supply, which may be regarded as interesting signs of the times. We do remember having seen contractors' notices on electric cooking installations before. The building illustrated is a large block of flats. The other view is also of a block of flats under construction, and the legend runs:—To Let, Luxurious Flats.

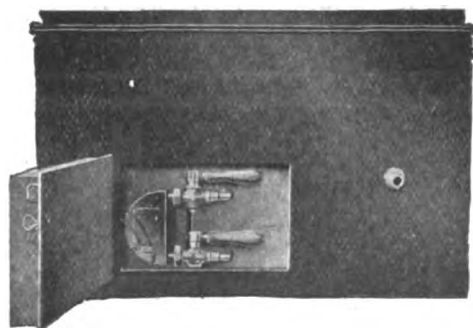


A CONTRACTOR'S BOARD IN MARYLEBONE.

All the Latest Labour-saving Inventions, Lifts . . . Cleaning Apparatus . . . Cooking (Electric Cooking Stoves), &c. The latter block has been built by Mr. Charles Lee, one of the large Marylebone consumers, and the well-known Willesden magistrate. Mr. Seabrook points out that the photographs illustrate the strides that electric heating and cooking have made, and that we shall soon be able to say that their advantages are as well-known to the public as those of electric lighting.

### AN ELECTRIC WATER HEATER

A NEW water-heater for giving a continuous supply of hot water for domestic purposes has been introduced by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.). One of these, of the 10-gallon size, is illustrated here. Through the open door can be seen the heating element, which is in reality a small pocket for water with low loaded elements mounted on either side. In the case of the 10-15 gallon tank, this element is only loaded to 300 watts. On either side of this pocket or circulator will be seen a stop-cock; the idea of these stop-cocks being that water may be turned off from the circulator, and the circulator may be removed bodily from



"PLEXSIM" HEATER FOR CONTINUOUS HOT WATER SERVICE.

the tank without interfering in any way with the tank or the plumb connections. The water container consists of an inner tank made of tinned copper, around which is 1½ in. of slag wool or other lagging. There is a hinged lid covering the whole body, so that the inside of the tank can be readily cleaned. This lid is also lagged, as is the inspection door to the circular chamber. As water is constantly passing through the circulator, the water in the main body is slowly raised in temperature. Starting from "all cold," it will take a considerable number of hours to get the water to a tempera-

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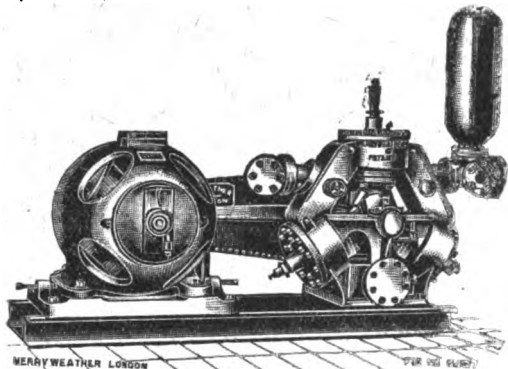
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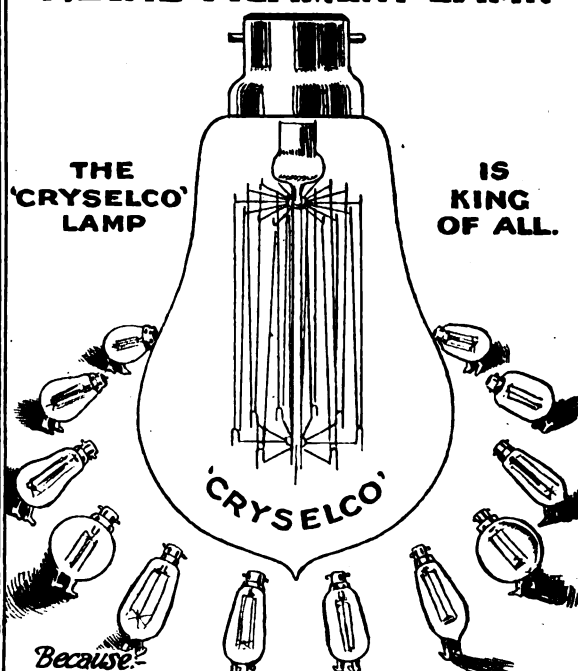
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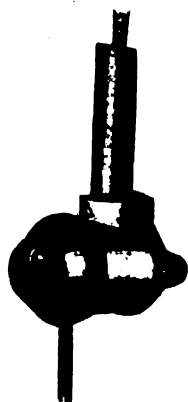
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ture of, say, 150–180° F., but when this temperature is once reached the lagging of the tank prevents much loss, and it will be found in actual practice that with the current switched off at, say, 6 o'clock at night, the fall in temperature is not more than from 20 to 40°, depending upon the season of the year. As a consequence, when the current is switched on in the morning it does not take long for the temperature again to pick up to the 150–180° F., which is an ordinary hot water temperature. If it is convenient to leave the apparatus in circuit day and night, the loading can be slightly less.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Ardee.**—Mr. J. W. McKeever, of Aclare Lodge, has been given permission to erect poles and cables on the public road to enable him to light Ardee with electricity. He has also arranged to light the town of Collon.

**Armagh.**—The question of lighting the town by electricity is engaging the attention of the U.D.C.

**Australia.**—The Sydney Municipal Council invite tenders for arc lamp carbons, meters, and maximum demand indicators. Tenders by July 20th. Copy of specification may be seen at 73 Basinghall Street, E.C.

**Ballaghaderreen.**—The Castlerea District Council has applied to the L.G.B. for sanction to a loan of £1,263 for the provision of additional generating plant for the electric lighting of Ballaghaderreen.

**Loughrea (Ireland).**—The Loughrea Electric Supply & Lighting Co., which is a newly-formed company, is about to put down a small generating station, and the Town Commissioners have accepted its offer to light the streets from September to May with forty-three lamps of 50 and 100 c.p.

**Preston.**—It is proposed to appoint a Sub-committee to consider the necessity for extensions.

**Sweden.**—According to a Belgian Consular Report, the demand for electrical fittings in Sweden is greater than can be supplied by the Swedish manufacturers; at present Germany is foremost in the market.

**Wolverhampton.**—Mains extensions at an estimated cost of £1,575 are contemplated.

### Wiring

**Blackpool.**—The Corporation has sent to Paris to get new ideas for electrical illuminations which will be a special feature of next autumn season.

**London.**—St. Matthew's Church, West Kensington Park, is to be electrically lighted. Rev. F. B. Marsdin, Vicar.

**Wolverhampton.**—Firms desirous of tendering for the electric lighting of Walsall Street school are invited to send their names to the Secretary, Education Offices, Town Hall, not later than May 12th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Accrington.**—Cinematograph theatre, Whalley Road.

**Broadstairs.**—New school for 320 scholars, for Kent Education Committee. Architect, W. H. Robinson.

**Bury.**—Cinematograph theatre, Bury Bridge.

**Darwen.**—Fourteen new houses in the Anchor district.

**Denbigh.**—New market, public hall, fire brigade station, and offices.

**Folkestone.**—New band pavilion. Town Council.

**Gateshead.**—Secondary school for Education Committee. Architect, W. F. Purser, 10 West Street.

**Glasgow.**—Glasgow South Side Telephone Exchange. H.M. Office of Works, Storey's Gate, London.

**Great Harwood.**—New weaving shed. Premier Mill Co.

**Heywood.**—New mill. James Byrom, Bury.

**Huddersfield.**—Thirty workmen's dwellings in Meltham Road. Town Clerk.

**Ipswich.**—Extensions at Borough Isolation Hospital. Architect, H. M. Cautley, The Thorofare.

**Kilmarnock.**—Extensions at infirmary.

**Manchester.**—New industrial school at Cheadle Heath.

**Seaton.**—School for Cumberland Education Committee. Architect, J. Forster, 13 Earl Street, Carlisle.

**Tyldesley.**—New variety hall, Shuttle Street.

**Wallasey.**—New fire station. Town Clerk.

**Wrexham.**—Girls' County school. Architect, W. D. Wiles.

## Miscellaneous

**Australia.**—The Victorian Railways Commissioners invite tenders for 100 series enclosed flame (long burning) arc lamps for the Melbourne Railway Yard. Tenders by May 13th.

The Adelaide Tramways Trust requires miscellaneous equipment for overhead trams. Tenders by May 26th.

The above information is of use only to firms with Australian agents to whom they can cable. Copies of the specifications and form of tender may be seen at 73 Basinghall Street, E.C.

## TENDERS RECEIVED AND ACCEPTED

**Arbroath.**—The tender of Messrs. Underhill & Ritchie, of Glasgow, has been accepted for lighting the Parish Church.

**Blackpool.**—The contract for six open-type bogie cars has been given to the United Electric Car Co.

**Norwich.**—The D.P. Battery Co.'s tender has been accepted for supplying and erecting 252 L21 type cells for £840, with free maintenance for one year, and maintenance at £83 4s. per annum for the succeeding nine years, subject to the L.G.B. sanction to the loan.

**Rawtenstall.**—Messrs. Babcock & Wilcox's tender has been accepted for water-tube boilers. Other firms tendering were the Stirling Boiler Co., Clarke, Chapman & Co., the Howden Boiler Co., and T. Beeley & Sons.

**Erratum.**—Siemens Bros. Dynamo Works inform us that, owing to a clerical error, the contract for lamps for the Belfast City Corporation Tramways was wrongly stated as having been awarded for the Bristol Tramway.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £65 10s. to £66. (Last week, £66 10s. to £67.)

**Bankruptcies, Liquidations, &c.**—The Leicestershire & Warwickshire Electric Power Syndicate is to be wound up voluntarily. Mr. T. W. Holland, 84 Coleman Street, E.C., is liquidator.

The public examination in the bankruptcy of W. H. Pease (Scarborough) will be held at the County Court Hall, Bank Street Lane, Sheffield, at 2 p.m. on May 14th.

The liquidator of the Davis Electrical Co. has been released.

**Change of Telephone Number.**—The telephone number of the Langdon-Davies Motor Co. has been changed to City 2744 (2 lines).

## APPOINTMENTS AND PERSONAL NOTES

Mr. J. A. Robertson, who is leaving Greenock for Salford, has been appointed Consulting Engineer to the Greenock Corporation until the completion of the extension works to Port Glasgow. A Sub-committee has been appointed to confer with Mr. Robertson in connection with the vacancy for a successor.

Mr. S. Trow Smith, Engineer and Manager of the Gas Department of the Leek U.D.C., has been appointed Gas and Electrical Engineer at Malvern at a salary of £350 rising to £400. The other names on the short list were published in our last issue.

Mr. H. P. Stokes, Electrical Engineer and Tramways Manager to the Bexley Urban District Council, has had his salary increased by £100 per annum.

The salary of Mr. C. Garnett, Borough Electrical Engineer at Darwen, has been increased by £50 a year.

Mr. Charles Lill, Sales Engineer of the Hackney Electricity Department, has resigned on securing another appointment.

Applications are invited for the post of Head of the Engineering (Mechanical and Electrical) Department at the Ashford Technical Institute. Applications to the Director, Technical Institute, Folkestone.



## LOCAL NOTES

**Accrington: Extensions.**—A L.G.B. inquiry has been held into an application to borrow £33,530 for the extension of the electricity works. This will be devoted to duplicating the new gas-engine plant. A loan period of seventeen years is being sought for £28,000 to be spent on plant and foundations, and thirty years for the remaining £5,000 for buildings.

**Ashton-under-Lyne: L.G.B. Inquiry.**—There was a passage at arms between the Town Clerk and Mr. H. Ross Hooper, the L.G.B. Inspector, at the inquiry last week on an application for sanction to a loan of £53,476 for extensions. Of this £34,924 was part of a sum applied for in 1910 for future extensions, for which, however, sanction was withheld for further particulars. The matter had, however, been allowed to rest until now, and in the meantime there had been an overdraft on the electricity account of £35,463. Mr. Hooper complained at having to go into the matter again after four years' delay, and also objected to local authorities spending money on extensions before the loans were sanctioned.

**Birmingham: Electric Refuse Carts.**—Two electric battery vehicles are to be supplied by the Electricity Committee at a cost of about £550, for the removal of street refuse.

**Blackpool: Electricity Accounts.**—The consumers have increased from 2,100 to 2,461, and the maximum demand from 3,179 to 3,600 kw. Five and a half million units were generated, an increase of 685,000 over last year. Fifty per cent. of the increased output has been for residential lighting.

**Bournemouth: Electric Cooking.**—The Bournemouth & Poole Electricity Supply Co. are doing their utmost to improve the heating and cooking load, and gave successful demonstrations of electric cooking at Havergal Hall from Tuesday to Saturday last week.

**Bristol: The International Exhibition.**—A very complete lighting scheme has been arranged for the lighting of this exhibition, which is to open at Ashton Gate on May 28th. About five miles of special mains will be laid by the Corporation, including a cable which will be laid by divers across the river, and anchored down in trenches which will be allowed to fill up. The supply will be at 6,000 volts, transformed at a sub-station to 365 volts for power and 210 volts for lighting. The cable laid for the exhibition will be afterwards utilised for supply of districts which might otherwise have to wait long for a supply. The exhibition has guaranteed a minimum consumption of current costing £6,000. Elaborate decorative lighting and illuminated cascades will be features of the scheme.

**Girvan: Electric Lighting Proposal.**—Messrs. Purves, consulting engineers, of Edinburgh, have asked the Council's permission to their obtaining a Provisional Order.

**Golcar: Peculiar Application for Bulk Supply.**—The Clerk to the U.D.C. has asked Mr. A. B. Mountain, Borough Electrical Engineer at Huddersfield, upon what terms the Corporation would supply electricity in bulk if the Council could distribute the supply. Mr. Mountain has replied that the Corporation has already powers to supply in Golcar itself, and has a large number of consumers.

**Lowestoft: Exhibition.**—An "Electrical Home" Exhibition has been held at Lowestoft. The Corporation had an interesting exhibit of various domestic applications.

**Manchester: Large Contribution to Rates.**—The net surplus on the electricity undertaking has risen from £28,331 to £36,760 for the year, which is an increase of £7,260 over the estimate. The units sold have increased from 104,000,000 to 117,000,000. The estimates for the forthcoming year are 130,000,000 units, but the Committee does not expect the surplus to increase proportionately until the new capital outlays are fully productive and the coal prices are easier. £30,000 has, however, been earmarked for the contribution to relief of rates, as compared with £28,500 last year.

**Macclesfield: Diesel Engine Station.**—As mentioned in our last issue, the Macclesfield electricity supply was inaugurated on Saturday, April 18th. The engine-room contains two 160-kw. Diesel sets. The engines are by Hick, Hargreaves (Bolton), and are of the vertical, three-crank type, running at 250 r.p.m., and driving General Electric Co. (Witton) D.C. generators. The switchboard was also supplied by the G.E. Co. A battery of Tudor cells, with a capacity of 570 ampere-hours at the 10-ampere rate, a three-wire booster, and a compound-wound balancer complete the equipment. The distribution is 2 x 230-volt three-wire, with Pirelli three-core, paper-insulated, lead-covered, steel-armoured cables.

**Oldham: Suggested Free Supply.**—The Electricity Committee has received a deputation from the Oldham Royal Infirmary begging them to supply electricity either free of charge or at a specially low price. It appears that the Gas and Water Committee have allowed concessions of this nature, but it is extremely doubtful whether the Electricity Committee can legally do so.

**Penketh: A "Contiguous Area."**—The Parish Council of Penketh, which is in the area of the Lancashire Electric Power Co., desires to obtain electric supply. The Lancashire Power Co.'s mains do not extend to there, but the Warrington Corporation is willing to supply Penketh, and the Power Co.'s permission to this is being sought.

**Queenstown: Public Lighting.**—The Gas Company proposes to raise the price for street lighting. The Council has decided that electric lighting would now be cheaper, and will install it if the Gas Company refuses to adhere to the old rate.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Calcutta Tramways Co.**—In spite of an increase of £10,000 in traffic receipts the expenditure has decreased by £6,523. A dividend of 7s. per share has been declared, making a total of 9½ per cent. for the year.

**Johnson & Phillips.**—As reported in our last issue, the net profit balance for the year was £12,755, which it is proposed to carry forward. At the meeting last week, in reply to a complaint that there was no dividend, the Chairman said that the Board regretted this as much as anybody else, because it was an open secret that the directors held nearly five-sixths of the total shares and stock.

**London Electrical Trading Co.**—Dr. H. Charlton Bastian, F.R.S., presiding at the adjourned second ordinary general meeting of the Company held on the 9th inst., said that the turnover for the sixteen months ending October 31st, 1913, had been more than doubled as compared with any previous sixteen months. In order to establish the position of the Company in many markets, it had been necessary to accept low prices in the first instance, and consequently the net profits were small in proportion to the turnover. The payment of a dividend of 4 per cent. on the ordinary shares was approved. Rear-Admiral the Commendatore Persico, R.I.N., was re-elected a director of the Company.

**Woking Electric Supply Co.**—At the recent annual general meeting, a statement was made with regard to supply to Chobham. It appears that there is a demand for a supply in Chobham Village, which is in the Ascot Company's area, but this company is unable to supply them, and so far has not consented to the Woking Co. coming in, although it only means the extension of the mains by a few yards. This seems to be a case in which an application to the Board of Trade for consent should be successful.

## NEW COMPANIES

**VENNER'S ELECTRICAL COOKING & HEATING APPLIANCES**, 6 Old Queen Street, Westminster. Capital £100,000. To carry on the business of manufacturers of, and dealers in, electric heating and cooking devices, and to adopt an agreement with R. F. Venner.

**PREMIER VALVE LTD.**, electrical and mechanical engineers, 54 New Broad Street, E.C. Capital £1,500. Private company.

**TRANSISO SYNDICATE**, 68 Cowcross Street, E.C. Manufacturers of and dealers in electrical appliances, &c. Capital £40,000.

**TUBEX ENGINEERING CO.**, 55 Victoria Street, S.W. Capital £5,000. Electrical and mechanical engineers. Registered by Jordan & Sons.

**ARGENTINE ELECTRICITY CO.**, 62 New Broad Street, E.C. Capital, £45,000. Objects as title.

**A. W. BEUTTELL, LTD.**, 109 Victoria Street, S.W. Capital, £10,000. To take over the business of electric light and power engineers carried on by A. W. Beuttell at 203 Victoria Street, S.W.

**CHIPPING NORTON ELECTRIC SUPPLY CO.**, 50, Cannon Street, E.C. Capital £10,000. To take over the business of the present company, and to adopt an agreement with W. H. Schultz.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 384 [VOL. X., No. 19]

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THURSDAY, MAY 7, 1914.

[PRICE ONE PENNY.]

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## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

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United Kingdom. 6s. 6d. per Annum.

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Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time or Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

WE announce with regret the death of Mr. Robert Kaye Gray last week. (Page 250.)

THE Institution of Electrical Engineers has issued its revised edition of the model general conditions which are understood to be in line with the views of the B.E.A.M.A., but have not been agreed to by the I.M.E.A. (Page 250.)

ALL the boiler hands at the Smethwick power house of the Shropshire, Worcestershire, and Staffordshire Electric Power Co., struck work at 10.30 a.m. on Monday last week, without notice. They were immediately replaced and have not been re-engaged. Steam was maintained. (Page 250.)

IN his report on the Senghenydd colliery disaster, Prof. Redmayne attributes the explosion either to sparks from the electric signalling apparatus or from rocks brought down by a fall, and quotes experiments showing that a mixture of gas and methane of a particular strength can be ignited by sparks from a 4.5 volt bell circuit, contrary to certain evidence given at the inquiry. He points out that the signalling installation was not in accordance with the present regulations, but owing to the date of its construction was exempt from them. Mr. Evan Williams dissents from Prof. Redmayne's view, and is of opinion that the ignition cannot have been electrical. (Page 251.)

A PAPER by Mr. L. Rothera, read before the Institution of Mechanical Engineers, dealt with the application of electric driving to existing rolling mills, and emphasised the advantages of electric power. (Page 252.)

A REPAIR to a shaft cable is described in a paper by Mr. F. Smith, read recently before the Association of Mining Electrical Engineers. (Page 252.)

SEVERAL additional types of electric safety lamps have been approved by the Home Office. (Page 253.)

SOME new flame-proof mining circuit-breakers and switches are described in an illustrated article. (Page 254.)

AN abstract of a Paper read before the Association of Mining Electrical Engineers by Mr. J. A. Kerr, Natal, deals with the maintenance of electrical plant in collieries. Some of the troubles met with are mentioned, and remedies are suggested. (Page 254.)

MR. BEADSMOORE, in a Paper on fault testing, insists that the colliery electrician must have proper instruments for locating faults in addition to the usual "Megger." (Page 255.)

A PAPER by Mr. J. Glynn Williams, read before the Association of Mining Electrical Engineers, referred to a number of practical points in connection with mining electrical equipment. (Page 255.)

A NEW electrical signalling system for mines is described. (Page 256.)

AMONGST the patent specifications published during April were several dealing with magnetic separators, safety lamps, and signalling apparatus, which are of special interest to mining engineers; also a few of interest to metallurgists, including one describing the preparation of very finely divided copper, and another treating of a process of ore smelting by the use of eddy currents. (Page 257.)

THE connections of leakage indicators for mines are discussed in our Questions and Answers column. (Page 257.)

AT the last meeting of the "Point Fives" an address dealing with experience with different types of electric cooking apparatus by Mr. J. W. Hame was read. Several well-known central station engineers joined in the discussion. (Page 259.)

THE annual dinner of the Electrical Contractors Association was held at Leicester on Wednesday last week. (Page 259.)

A RECENT tramway accident at Rochdale is attributed by the Board of Trade inspector to excessive speed. (Page 259.)

SUCCESSFUL experiments are reported with the new Marconi wireless telephone.—The purchase by the Corporation of the plant of the National Telephone Co. at Hull which had been taken over by the Post Office has been completed. (Page 259.)

A LAPSED PATENT for a fire indicator for ships has been restored by the Comptroller. Specifications published last week include a method of increasing the strength of magnets, an automatic safety device for trains, a process for the preparation of ductile tungsten, and improvements for automatic telephone systems.—Some of the specifications published to-day relate to

high-frequency generators, electric furnaces, switches, telephony, and wireless.—Amongst the expired patents is one for a combined switch and cut-out for H.T. lighting systems which has had a life of eleven years. (Page 260.)

In our Trade Section will be found descriptions of some new semi-indirect fittings and a new electrical advertising device. (Pages 261 and 262.)

OUR list of tenders invited and prospective business shows that considerable activity may be expected during the next few months. Among the towns requiring new plant and mains are York, Rotherham, Devonport, Lytham, and West Bromwich. (Page 263.)

THE Manchester Corporation Bill for purchasing the Trafford Park electricity undertaking is occupying the attention of the House of Lords Committee.—The Board of Trade has granted the Bury Corporation power to supply Heywood in bulk, in spite of the opposition of the Lancashire Power Co.—A portion of the profit of the Coventry electricity department has been allocated to giving a bonus to the employees.—New 1,000 kw. extensions have been inaugurated at Dewsbury, and a 3,000 kw. set has passed its official tests at Aberdeen. (Page 264.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, MAY 7TH.

*Iron and Steel Institute.*

10.30 a.m. Annual meeting at Institution of Civil Engineers. FRIDAY, MAY 8TH.

*Iron and Steel Institute.*

10.30 a.m. Annual meeting continued. SATURDAY, MAY 9TH.

*Association of Mining Electrical Engineers.*

4.30 p.m. S. Wales Branch. Annual General Meeting at Caske Hotel, Neath.

*Birmingham and District Electric Club.*

7 p.m. At Swan Hotel, New Street. "Uses of Electricity 100 Years Hence," by W. E. Milns. TUESDAY, MAY 12TH.

*Institution of Civil Engineers.*

6.30 for 7 p.m. Annual dinner in the Institution Hall.

### The London Electrical Engineers.

Headquarters (46 Regency Street, S.W.) open Sats. till noon.

Rating Exam. for all Cos. from 7 to 10 p.m. every Wednesday.

Min. range each evening this week, 7 to 9 p.m. Rating Exam. all Cos. Wednesday, May 13th. Also annual course of musketry at Purfleet for all Companies.

The Corps Sports will take place at Duke of York's Headquarters on Saturday, May 9th, at 3 p.m.

Musketry Practice, Purfleet Rifle Range, Saturday, May 16th, 1 p.m. till dusk.

(TO-DAY) THURSDAY, MAY 7TH, C. Co. FRIDAY, MAY 8TH, D. Co. MONDAY, MAY 11TH, A. Co. Supper at St. James Tavern, St. James Park Station, 7 p.m. TUESDAY, MAY 12TH, B. Co. THURSDAY, MAY 14TH, C. Co. FRIDAY, MAY 15TH, D. Co.

### OBITUARY

ROBERT KAYE GRAY.

A familiar and respected figure at the meetings for many years of the Institution of Electrical Engineers was Mr. R. Kaye Gray, who, after a long illness, passed away at the age of sixty-two on April 28th at Brighton. Mr. Gray had for many years taken a prominent part in the affairs of the Institution, and was President in 1903-4. At the time of his death he was still a Director of the India-Rubber, Gutta-Percha, and Telegraph Works Co. (Silvertown), although he resigned his position of Managing Director last year. He was actively connected with the ever-widening interests of this Company for about forty-five years, and was also on the board of several cable companies. His connection with submarine telegraphy dated from joining the staff of the late Sir Charles Bright in 1870, and among cables which he took part in the laying of was one from Gravelines to Bordeaux during the Franco-German war, several later French Government cables, the Direct Spanish cable from the Lizard to Bilbao, and a number between 1882 and 1884 to parts of central and South America. He was born in Scotland, although educated partly in London and Paris. Many will regret the loss of a man of his kindly and modest nature, who did so much by his work in connection with hospitals and charitable institutions to assist his fellow-men. Mr. Gray's remains were laid to rest at East Wickham, on Saturday afternoon last.

### GENERAL CONDITIONS

THE revised form of model general conditions recommended for use in connection with contracts for electrical works, which has engaged the attention of a special committee for some time, has now been issued by the Institution, and copies can be obtained at the price of 1s. It will be remembered that there have been negotiations between the Institution, the British Electrical and Allied Manufacturers' Association, and the Incorporated Municipal Electrical Association, and that while a considerable measure of agreement was arrived at between the Institution, the B.E.A.M.A., and the Council of the I.M.E.A., a draft of the principal agreed clauses placed before the last annual general meeting of the I.M.E.A. was not ratified. The matter is, we understand, to be discussed further at the June Convention of the I.M.E.A. In the meantime, however, the Institution has issued the code of conditions which we believe embody most of the points that were desired by the B.E.A.M.A., and it may be expected that it will shortly be adopted by the latter. The main points of discussion had reference to arbitration, consequential damages, and terms of payment. Agreement is now practically reached on these and other points, but with regard to damages for delay in completion, the limiting percentage of the contract value which may be deducted is not defined, but is left blank to be filled in, in particular cases. We understand, however, that the B.E.A.M.A. is likely to agree upon a figure for this of which its members will be recommended to press for insertion.

**Strike at the Smethwick Power House.**—The Smethwick Power House supplies not only the network of tramways belonging to the Birmingham and Midland Joint Committee, but also the consumers of the Shropshire, Worcester, and Staffordshire Electric Power Co., among whom are several large works, rolling mills, &c., and a stoppage at the power house in the daytime would have serious results. This was only averted by the prompt action of the Engineer in the following circumstances. A man who had been engaged as stoker had been transferred to a post on the engine-room repairs staff, as his work as stoker had not been considered satisfactory, and a man was taken from the boiler-house repair gang to fill the vacancy. This was resented by the other boiler-house hands, and, on Monday morning last week, all of them, comprising stokers, stokers' assistants, coal trimmers, ash wheelers, &c., handed in a notice to the effect that they intended to cease work within one hour unless the man was removed and the vacant position given to one of themselves. The notice was followed by a deputation of the men, who had, as a matter of fact, already "downed tools." The men were informed that in no circumstances could the management allow men to elect anyone to fill vacancies which may arise from time to time, whereupon the men left the premises, and the boiler house unattended, at 10.30 a.m. Fortunately, by calling on various members of the other departments of the electric supply undertaking, steam was well maintained, and efforts were at once commenced to fill the vacancies caused by the men leaving the company's service. All the vacancies have now been filled, and not one of the hands who ceased work has been re-engaged.

**The Electrical Trades' Benevolent Institution.**—We have received a complete list of the contributions received in connection with the festival dinner, and those received up to April 15th, together with a supplementary list up to April 30th. It appears that the correct total of special chairman's list of contributions which Mr. Hirst was instrumental in getting together, in connection with the dinner, is £2,463 15s. 1d. Other contributions in connection with the festival amounted to £418 15s., making a total of £2,882 9s. 1d., which is a material increase upon the amount announced by Mr. Hirst at the dinner. Other contributions received during the year, including those up to April 30th, amount to £179 8s. 2d. This liberal support will enable the invested funds of the Institution to reach £8,000. It has been pointed out, however, that no satisfaction can be felt till the invested fund reaches at least £20,000, in view of the considerable calls that are likely to be made on the Institution for pensions in the course of the next three or four years. Members of staffs of electrical firms should realise that it is a satisfactory business proposition from their own point of view to become members, and are reminded that the subscription for members is 10s. per annum, or such larger amount as each member is willing to give, and may be payable in instalments.

# ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Published on the First Thursday of each month

## THE SENGHENYDD DISASTER

THE reports of the Commissioner (Prof. Redmayne) and assessors (Messrs. Evan Williams and Robert Smillie), appointed by the Home Office to investigate the explosion at the Senghenydd Colliery, South Wales, on October 14th last, has now been issued. The inquiry was followed in our columns as to its bearing on electrical questions (see *ELECTRICAL ENGINEERING*, Feb. 5th, p. 79, and March 5th, p. 129), and it will be remembered that one of the most important questions at issue was whether the ignition of gas could have been caused by sparks from the electrical signalling system.

Prof. Redmayne describes this signalling system as follows:—

"There were a number of sets of signalling apparatus in different parts of the colliery—over a dozen in all—and each set consisted briefly of an electric bell of the trembler pattern, which though protected by a cast-iron cover was not gas-tight, a battery of anything from six to nine dry cells of the 'Dania' pattern, giving when new about 1·5 volts per cell, and two bare wires, described as No. 8 galvanised steel wires, supported on insulators, which in turn were secured to the side timbers. The wires were run 12 or 18 inches apart on the same side of the roadway. The bells and batteries were, in general, fixed in engine houses. Electric sparks, which may or may not have been capable of igniting an explosive mixture of firedamp and air (the evidence on this point will be examined later), were undoubtedly, by the very nature of the apparatus in use, of frequent occurrence. Every time the wires separated after having been brought together or bridged across by a knife or file for the purpose of giving short sharp rings of the bell, a spark or sparks would be formed at the instant of break, and every time the bell was rung there would be a rapid succession of sparks at the make and break contacts beneath the iron cover."

After a full discussion of various theories which had been advanced as to the seat and origin of the explosion, the Commissioner gives it as his conclusion that there is strong probability of the explosion having originated on the Mafeking Incline, and that it was preceded by heavy falls liberating a large volume of gas. "The only apparent means of ignition," he continued, "would be sparks from the electric signalling apparatus, or from rocks brought down from the fall, and we know that explosions have been originated by both these causes."

He then quotes general regulation No. 182, which definitely requires signalling wires and instruments, in a part of a mine where inflammable gas is likely to occur in quantity sufficient to be indicative of danger, to be arranged so that there shall be no risk of open sparking; but later in the report points out that the installation in question was exempt from the present regulations, as it had been in use before June 1st, 1911, and was in accordance with the old code of 1905, which permitted bare-wire signalling on haulage roads where the pressure did not exceed 15 volts.

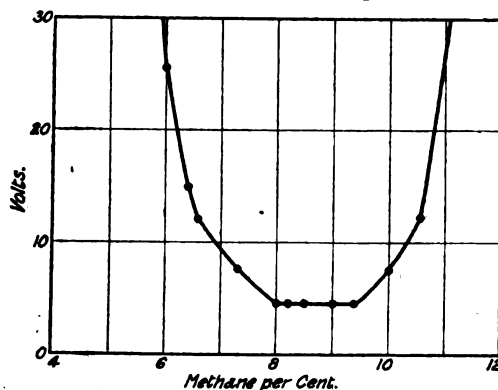
With regard to the experiments which were conducted at the time of the inquiry at New Tredegar to determine under what conditions of voltage the sparks from bell circuits could ignite gas, Prof. Redmayne writes as follows:—"It was argued by counsel appearing on behalf of the owners and management, and evidence was called to show, that the sparks caused by bringing the wires together, or in the ringing of the bells, were not of sufficient intensity to ignite gas—in effect that there was no open sparking. In this connection I can only regret that the safer plan of excluding sparks altogether was not adopted. It is all the more astonishing that the management should have faced the risk that the sparks produced might have ignited gas, in view of the Bedwas Colliery explosion, which occurred on March 27th, 1912, and which was proved beyond reasonable doubt to have been caused by the sparks from an electric bell."

In a note following his main report, Prof. Redmayne gives it as his opinion that the New Tredegar experiments were not "sufficiently exhaustive and definite to warrant their being regarded as finally settling the question of the safe limit, in respect of electrical pressure and current, for electrical signalling apparatus when used in any part of a mine

which is likely to contain inflammable gas in dangerous quantity."

Further experiments were conducted by Dr. Wheeler, the results of which are given as an appendix to the report. Dr. Wheeler found that with three Dania cells giving a current (on closed circuit) of 0·45 amperes under a pressure (on open circuit) of 4·5 volts it is possible to produce a spark, by short-circuiting the current in the signal wires to give a signal, which will explode a mixture of air and methane when methane is present to the extent of 8·2 per cent.

A portion of Dr. Wheeler's curve of results is reproduced here, from which it will be seen that ignition was obtained



CURVE SUMMARISING RESULTS OF  
DR. WHEELER'S EXPERIMENTS.

with much lower voltages than was the case in the New Tredegar experiments.

Mr. R. Smillie (President of the Miners' Federation) expresses his general agreement with the Commissioner's report, but comments on one or two non-electrical matters. Mr. Evan Williams (Chairman, South Wales & Monmouth Coal Owners' Association), the other assessor, however, dissents from Prof. Redmayne's conclusions, and writes a separate report. Dealing with the signalling installation he says:—"To my mind the evidence is quite conclusive that the characteristics of the installation were such that no spark capable of igniting gas could have been produced." He is also satisfied that the position of the journeys at the top and bottom of the incline were such that no signalling could have been going on when the explosion occurred.

"Any sparking that may have taken place," he continues, "could, therefore, be produced only by the accidental contact of the two bare signalling wires. When two wires are pressed together in any way the surfaces that touch have an area many times larger than the points of contact of a knife edge across them would have, and it is a well-established fact that the current necessary to ignite gas increases in direct proportion to the area of the surfaces in contact. The further comparison must, therefore, be made as between the small area of contact of the knife edges at the Rescue Station experiments, and the larger area of the surfaces in contact of the two wires in the mine, and this strengthens my conviction that the possibility of an electrical cause of the origin of this explosion can be entirely dismissed." Mr. Williams attributes the explosion to the presence of an open light in the lamp cabin.

**The Home Office Electrical Mining Regulations.**—A new edition of the General Regulations as to the installation and use of electricity in mines, just published (Mines and Quarries, Form No. 11), contains a revised memorandum on the regulations. This is almost exactly in the same words as the previously published memorandum, except that in commenting on Regulation 129 on cables, the desirability of making the bedding between the lead and the armouring of lead-covered, armoured cables, or between two layers of armouring in double armoured leadless cables of non-inflammable material, is pointed out. Such other alterations as there are, are only of a verbal nature.



## ELECTRICAL DRIVING OF ROLLING MILLS

A PAPER by Mr. L. Rothera, on the Application of Electrical Driving to Existing Rolling Mills, was read before the Institution of Mechanical Engineers on April 24th. The author first reviewed the conditions which render conversion to electric drive desirable, and classified these under the headings of economy of running, improved drive, considerations of space, and greater use of existing plant. The question of economy depended on local conditions, and the main factor was the cost at which electrical energy could be obtained. In the case of blast-furnace or coke-oven gas driven plants this might be as low as 0.1d. per unit, and the lowest figure for outside supply was about 0.83d. It would not usually pay to put down a special steam-driven works, except where "waste" heat was available. The economy also depended on the lay-out of the works, and usually the gain in transmission losses with electric working was enormous. Again, much depended on the class of work done. Generally speaking, the greater the fluctuations in the load, the more advantageous was electric driving. It was undisputed that the uniform turning moment of the electric motor produced a better class of material than a pulsating drive, and the better grip of the material, together with the lower drop in speed on heavy load and the greater overload capacity enabled a higher average speed of working to be attained. Diagrams were given in the Paper showing the enormous saving in space that is possible by substituting electric motors for steam engines, and cases were quoted to show where increased power is required the installation of electric motors is much cheaper than larger engines and additional boiler plant. That electric rolling-mill drive could more than hold its own was shown by the fact that more than 200 mills in this country have been electrically equipped during the last six years.

With regard to the relative merits of continuous-current and three-phase working, this was partly settled by the conditions of supply, but, from the point of view of the mill motor, continuous current had advantages where variation of speed was required, and for very low mill speeds. Various methods, however, requiring the use of auxiliary apparatus, had been devised for enabling three-phase motors to perform variable-speed service economically.

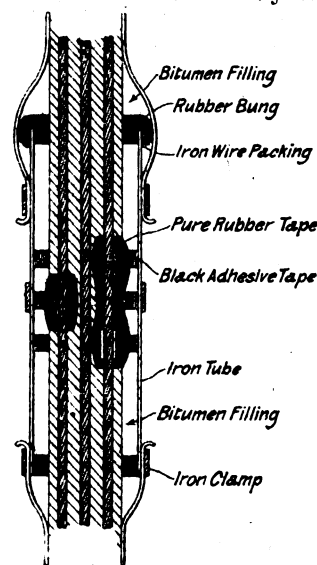
The latter part of the Paper dealt with the application of the drive to the mill. Modern practice had to a great extent gone in favour of direct-coupled motors, and in very many cases even at slow speeds the extra capital cost was more than counter-balanced by the gain in efficiency. Rope driving had not as high an overall efficiency as gear drive, because the losses remained practically constant at all loads, and were not, as in gear drive, practically a fixed proportion of the power actually being transmitted. Belt drive was not much used. The form of drive to be adopted when converting a mill was largely dependent on the lay-out of the mill. From the point of view of the length of time the mill has to be shut down during the change-over, rope driving has the advantage. In some special cases, however, direct-coupled motors have been fitted with practically no shutting-down of the mill. In general, heavier flywheels are required with electric motors than with steam engines. With geared motors the flywheel should be on the mill shaft rather than on the motor shaft. A number of electrically-driven mills were illustrated in the Paper.

In the discussion, Mr. F. Anslow suggested that the author had rather underrated the powers of the steam engine, and showed some lantern slides illustrating the differences between well and badly designed electric drives. Dr. B. Wiesengrund also showed a number of slides of electrically driven mills, and his remarks were principally in defence of gear driving. Mr. A. Holman spoke of some pioneering experiences in electric mill driving in India, and referred to the advantage which electric working had, of the possibility of determining the power being transmitted at any instant, which had often enabled him to localise troubles. Capt. C. H. Willis also related some experiences in converting old mills to electric drive, and Mr. Monks spoke of very satisfactory results after conversion of two mills from steam to electric drive in respect of decreased power consumption, increased output, and improved quality of work. Mr. H. Brown referred to the necessity for a rapid drop in motor speed, with the load if the energy storage of the flywheel was to be taken advantage of, and mentioned a new automatic contactor type of slip regulator for the purpose. With regard to gearing, he spoke of successful examples of mills driven through worm gear. Mr. A. H. Hall said that one of the most useful points in connection with electrical driving was that it enabled one to tell much more simply than by tensile tests, because at a certain point the power curve went up suddenly, and indicated almost exactly when annealing should

be started. He also raised several practical points of detail. Mr. H. H. Thorne also spoke, and Mr. Rothera replied to the discussion.

## A REPAIR TO A MINING CABLE

IN the course of a Paper on repairs to electrical plant, by Mr. F. Smith (Pinxton Collieries), read before the Midland branch of the Association of Mining Electrical Engineers, an account was given of a method adopted to repair a 19/16 three-core vulcanised bitumen insulated 1,100-volt shaft cable which was damaged by a falling piece of coal. The blow was so severe that it broke some of the armouring wire and started a short between two of the cores. One core was entirely burnt through and the other core was partly burnt. Fig. 1 shows how the repair was made. An iron tube 3 in. in diameter and 2 ft. 6 in. long was cut in halves longitudinally, then two india-rubber bungs were prepared to fill in the spaces between the tube and the bitumen sheathing. The armouring was cut through and laid back for several feet, and the bitumen sheathing stripped off for a distance of about a foot. The core that had been entirely burnt through was



SECTION OF REPAIRED CABLE.

then connected by two cable connectors and a piece of make-up wire. The second core, which was only partially burnt through, was reinforced by a cable connector. Each of these repairs was then taped with pure rubber and vulcanised rubber, and then three distance rings of black adhesive tape were wound on to give an outside diameter of 2½ in. After the two halves of the tube were placed in position, a mixture of bitumen and switch-oil was poured into the space between the cable and the tube until it was quite filled in with the mixture. After it had set, the top india-rubber bung was put in, and then the armouring was brought over the two ends of the tube and clamped down. The insulation resistances of the cable were as follows:—Testing pressure, 1,000 volts; before the breakdown, 45 megohms; one hour after the repair, 0.2 megohms; six days after the repair, 5 megohms; 13 days after the repair, 25 megohms. The armour conductivity is the same as when the cable was first installed.

**The Association of Mining Electrical Engineers.**—At the annual dinner of the Notts and Derby Branch of the Association of Mining Electrical Engineers, Mr. W. Maurice, in speaking of the important work done by the Association, said that it was the only electrical body of its kind recognised by the Mines Department of the Government, and that it was practically due to it that mining electrical engineers were officials under the Coal Mines Act.

**A Home Office Prosecution.**—At Durham last week the Coal Distillation Co. were prosecuted under the Factory Acts for leaving certain live conductors exposed at the by-product ovens at Littleburn Colliery. A workman named Blackburn came in contact with them, and had received a fatal shock. A fine of £10 and costs was imposed.

**Mining Fatality.**—A somewhat curious accident occurred at the Blaenavon Pit recently. It appears that an electric cable had burnt out and set fire to two rotten timbers which had been replaced but not removed, and a man was suffocated by the smoke.

## ELECTRIC SAFETY LAMPS FOR MINES

AN order has been issued by the Home Office approving several types of safety lamps for use in mines, in addition to those of which approval has already been signified (see ELECTRICAL ENGINEERING, Vol. IX., p. 817, June 5th, and p. 555, October 18th, 1913).

This order, which is dated March 16th, approves six patterns of electric lamps for general use, and four lamps for use by officials or for special purposes. The ordinary lamps are the following:—

The "B.A.C." LAMP, made by the British Accumulator Co., Ltd. (35 King Street, London). This has a stamped steel case and cover, and an internal fibre terminal plate carrying the

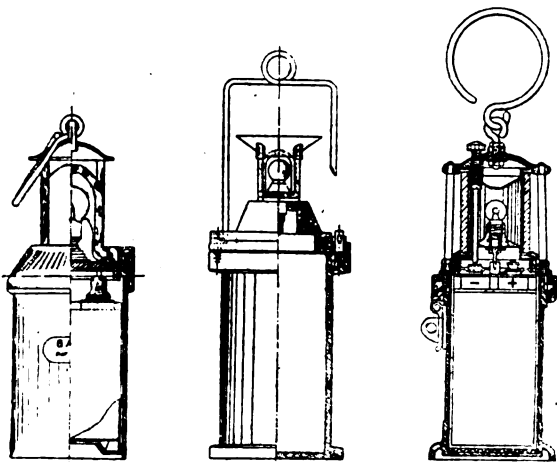


FIG. 1.—B.A.C. LAMP. FIG. 2.—TURQUAND KINGSWAY LAMP. FIG. 3.—JOEL-FORS LAMP.

contacts, bulb, and reflector. The outer glass is protected by a steel crown on four steel pillars, and is made gas-tight by a rubber ring. A magnetic lock is fitted. The total weight is 5½ lb., and, as in the case of all the ordinary lamps, it is specified to give 1 c.p. all round in a horizontal plane for nine hours, and 1½ c.p. over an arc of 45° in a horizontal plane. (See Fig. 1.)

The "TURQUAND-KINGSWAY" LAMP, made by the General Electric Co. (67 Queen Victoria Street, E.C.). This is shown in Fig. 2, and has a case of steel, aluminium, or aluminium alloy, and the cover of similar material makes a flame-tight connection with the case by an indiarubber washer, and is secured to the case by a T-section steel stud engaging a slot in the cover lined with a steel bearing plate, the lock and two dowels entering holes in the cover. The brass switch plate forms a flame-tight

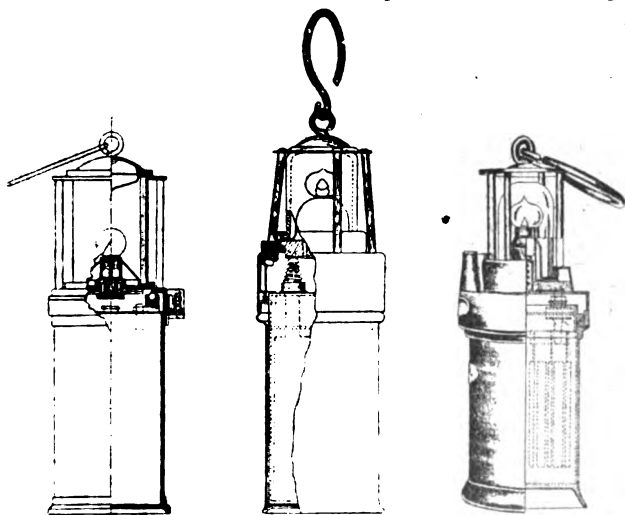


FIG. 4.—THOMSON-ROTHWELL LAMP. FIG. 5.—VARTA LAMP. FIG. 6.—WOLF LAMP.

connection with the cover, and engages a hollow screw lamp-holder carrying an insulated contact. This plate carries the protecting glass, which is held in position by a lip, and forms a flame-tight joint with the brass plate by means of an indiarubber washer. The glass is supported at the top of a metal crown by four pillars. Two alternative forms of lead lock are described, and the weight is given as 5½ lb. (See Fig. 2.)

The "JOEL-FORS" LAMP, TYPE 403M, made by J. Mills & Sons (Walkergate Brass Works, Newcastle-on-Tyne). This has

a case of cast aluminium alloy, and a flame-tight cover of the same material, secured by a bayonet joint and a riveted hasp and staple, and locked by a lead rivet or magnetic lock. A screwed castellated ring holds the cylindrical protecting glass in position between the cover and a cast aluminium alloy crown supported by four steel pillars; the joints are made flame-tight by asbestos or rubber washers; the detachable bulb-holder is secured by a spring clip. The flame-tight screw switch in the cover can only be brought into operation when the cover is in the closed position. The weight is given as 4½ lb. (See Fig. 3.)

The "THOMSON-ROTHWELL" LAMP, made by J. H. Rothwell & Co. (Sindley, Swinton) and the Thomson Co. (Marlborough Place, Oxford Road, Manchester). The case of this lamp is of steel, brass, or aluminium, with a flanged brass locking ring, and a cover consists of a middle base ring of brass or steel carrying an aluminium or steel crown supported by brass or steel pillars. The middle base ring is threaded internally to take a brass glass-retaining plate. A stout protecting glass forms flame-tight connections with the crown and retaining plate by washer of asbestos or other material. The glass-retaining plate also carries the lamp-holder and an insulated electrical contact piece. Either a lead or magnetic lock is fitted. The weight is given as 5 lb. 4 oz. (See Fig. 4.)

The "VARTA" LAMP, submitted by the Tudor Accumulator Co. This is shown in Fig. 5, and has a cylindrical stamped sheet steel seamless case, galvanised or enamelled outside, and a stamped steel top which is secured to the case by a bayonet flame-tight joint, and locked by a magnetic lock. A disc of insulating material within the lamp top carries the bulb, reflector, and switch contacts, and is secured to the cover by a screw ring which bears on a flange on the disc. A stout protecting well-glass forming a flame-tight connection with the

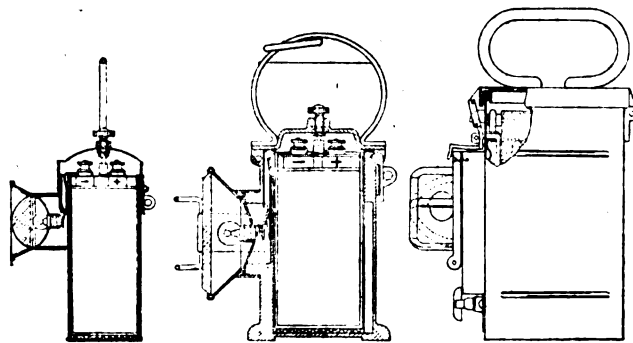


FIG. 7.—JOEL-FORS INSPECTION LAMP. FIG. 8.—JOEL-FORS HAND LAMP. FIG. 9.—VARTA OFFICIALS' LAMP.

lamp top by a washer of indiarubber or other suitable material. The well-glass is protected by a sheet steel crown supported by five steel pillars. The accumulators are fitted with sliding spring terminals. The weight is given as 6½ lb.

The "WOLF" LAMP, No. 2, of the Wolf Safety Lamp Co. (Bank Street, Sheffield). This is a modification of the Wolf alkaline and lead lamps already approved, except for details of construction of the case and locking arrangements. (See Fig. 6.)

The following lamps are approved by the order for use for work of exploration or rescue, or by officials:—

The "JOEL-FORS" INSPECTION LAMP, TYPE 303C, made by J. Mills & Sons (Walkergate, Newcastle). This lamp is of the bull's-eye pattern, with sheet iron case. It weighs only 2½ lb. A screw switch is fitted at the top of the case.

The "JOEL-FORS" ELECTRIC HAND LAMP, TYPE 403H, is a heavier pattern of bull's-eye lamp, with a cast aluminium alloy case, by the same makers. It weighs 4½ lb.

The "VARTA" ELECTRIC SAFETY LAMP, TYPE 2 Et 4, submitted by the Tudor Accumulator Co., is also a lamp with the lantern at the side, covered by an ordinary protecting glass. It is for the same c.p. as above, and weighs 7½ lb.

The "WOLF" RESCUE LAMP, No. 2, made by the Wolf Safety Lamp Co., is a modification of the Wolf Lamp, No. 2, referred to above, with which it is identical, except that the bulb and reflector are contained in a hooded shield, furnished with a stout protecting glass held in position by a screw ring locked by a screw inserted from the inside of the cover. Its weight is 5½ lb.

All the above special lamps are designed to give not less than 1½ c.p. for nine hours. The first three are illustrated in Fig. 7.

**The South Wales Miners' Federation.**—At the annual Congress last month at Cardiff, there was a long discussion on a report on the use of electricity in mines, in which Mr. T. Richards, M.P., urged the dangers that might be present. Ultimately, an extreme view of the risks involved prevailed, and a resolution was adopted asking the Labour Members in Parliament to endeavour to secure the prohibition of the use of electricity for motive power in fiery mines.

### MINING SWITCHGEAR

FOR the control of electrical plant in fiery mines the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), are introducing a range of switchgear which embodies a number of improvements. Included in this range are a number of explosion-proof circuit-breakers, one of which is illustrated in Fig. 1. The circuit-breaker is contained in a strong cast-iron case provided with long, well-machined flanges, which give a good metal-to-metal joint, and are effective in

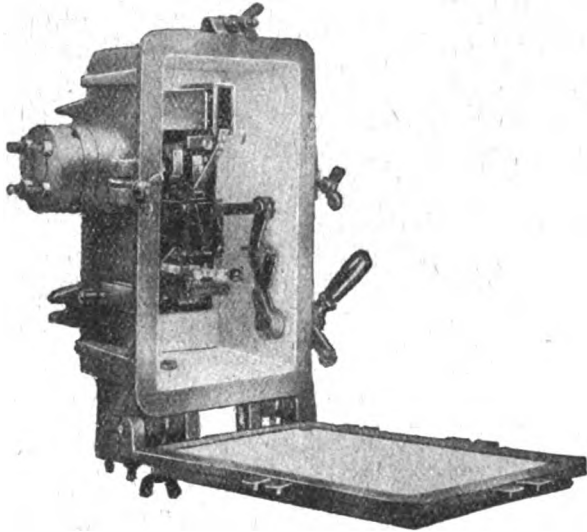


FIG. 1.—FLAME-PROOF MINING CIRCUIT-BREAKER.

cooling the products of an explosion in the interior of the box to a temperature well below the minimum ignition point of the most explosive atmosphere that is possible. In addition, the internal construction is such that an explosion can bring about no derangement of the gear. Efficient arcing shields are provided which prevent the arc reaching the metal case, which, nevertheless, is thoroughly protected with fire-proof insulating material. The lid, which is strongly hinged, is provided with a patented interlock which precludes any possibility of the circuit-breaker being opened when the lid is open, and so causing an ignition of the gas. The lid can only be opened when the circuit-breaker is in the "off" position, and when the lid is open the circuit-breaker cannot

be closed. Such are the internal arrangements that when the lid is open it would be a matter of difficulty for anyone to touch a live part accidentally. Another important feature is the flame-proof construction of the glands which are supplied to take various kinds of cable into the boxes.

A further new piece of mining apparatus made by the Company is the 5-ampere double-pole iron-clad explosion-proof switch with fuse shown in Fig. 2. One of the features that should be noticed is the shape which has been given to the case to reduce to a minimum the unoccupied space in the interior, while leaving adequate clearance between the live parts and

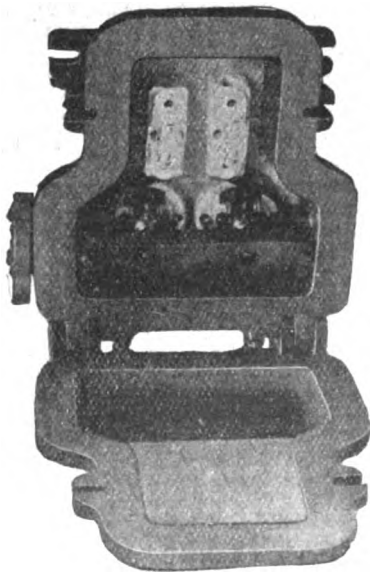


FIG. 2.—FLAME-PROOF ENCLOSED D.P. SWITCH AND FUSES.

the frame. The switch consists essentially of a pair of tumbler switches actuated by a handle passing through the side of the box, and connected to a substantial *lignum vita* coupling bar. The "on" and "off" positions of the switch are decisive and clearly marked. The designer has been aided in his work of reducing the dimensions of the box by the use of the "Rex" replacement fuse, which, while being of small proportions, has behaved excellently in the short-circuit

tests that have been applied to it. The metal of which the case is formed is  $\frac{3}{16}$  in. thick throughout, the cover is hinged and secured with hexagon nuts, and is interlocked with the switch movement in such a manner as to prevent the switch being operated when the cover is open. The machined flanges of the box and cover are 1 in. wide, and every care has been taken to eliminate possible points of exit for the products of the explosion. Where holes have had to be drilled in the case, as, for instance, to accommodate the pins about which the *lignum vita* coupling bar moves, the hole is plugged by a screw which is tightly fixed in position. The point of entrance of the spindle connecting the handle to the *lignum vita* batten is provided with a long bush; it is a very close fit, and in addition it is packed by means of a gland.

### ELECTRICAL WORKING IN COLLIERIES

IN a Paper read before a meeting of the Association of Mining Electrical Engineers, Mr. J. A. Kerr stated that it was often advantageous for colliery proprietors to install their own generating plant, owing to the cheapness of coal and the small amount of attention required. He also recommends the use of D.C. machines for pressures up to 400 volts. The greater immunity from breakdown at present enjoyed by A.C. motors is due to the fact that the manufacturers of the latter have usually expert knowledge of mining requirements, whereas much of the D.C. plant installed is only fit for factory use. When the motors are situated at some distance from the source of supply, however, three-phase high-tension machines are preferable. As regards the cables used for transmission, although the system of armouring and earthing is quite satisfactory when properly carried out and carefully maintained, in many cases better results can be achieved by making the insulation proof against the need for these devices, and working at a rather lower pressure. Generally speaking, it is safer on small installations not to resort to earthing unless it is possible to get a dangerous potential difference between each machine and earth. A difficulty met with on earthed systems is the scarcity of men who are competent to keep the earthing in a satisfactory state. There is also more labour required to shift the machines from one section of the mine to another, when this system is used. A case was mentioned where a three-core 0.25 sq. in. double-wire armoured bitumen cable developed a fault owing to the unequal expansion and contraction of the copper cores and the iron armouring, which caused the former to be decentralised. The method of locating a fault in bitumen cables by burning out is not recommended, as the current may be sufficient to decentralise the cores, a better method being to measure the drop along the armour with a low reading instrument. This method also has the advantage that the fault can be located to an inch. Trouble is sometimes experienced with the larger motors used, owing to the use of presspahn as an insulator for the windings. In a humid atmosphere the resistance of this material sometimes decreases sufficiently to cause short-circuits. Loose foundations and consequent vibrations are sometimes accountable for chafing between adjacent wires in the stators of high-speed motors. This eventually wears away the insulation and causes trouble. The remedies are, good foundations and securely anchored coils. Box-type brush holders are preferable to those of the hammer type, both for commutators and slip-rings. The practice of throwing dry graphite on rawhide pinions is deprecated on account of the tendency of the graphite to drift into the windings and cause trouble. With coal-cutting machines, care must be exercised that the oil which finds its way to the bearings is free from grit and suspended metal dust. A point worth remembering, also, is that the picks should be kept of equal length, and sharpened so that the points and not the edges do the cutting. Wherever oil-switches are used, the cables should not be led into the oil chamber, or the oil will tend to syphon out and damage the insulation. To cope with the difficulty sometimes experienced in the selection of reliable switchgear, the author suggests the formation of an "Inspection Committee," composed of members of the Association. A suggestion is also put forward that in place of the usual works tests, the manufacturer should be called upon to guarantee his plant when tested after it has been in actual operation for a certain period. In conclusion, the author mentions several points which he considers should be noted wherever electricity is used in collieries. A system of file cards giving full particulars of each motor and its accessories is recommended. Small motors in naked-light pits, when situated in the return

## FAULTS IN ELECTRIC CABLES

Use Raphael's portable direct-reading fault localiser (which gives the result in yards without calculation), and a Nalder portable moving-coil galvanometer.

**NALDER BROS. & CO.,**  
7, CARTERET STREET,  
WESTMINSTER, S.W.

Telephone—  
GERRARD 779.

Telegrams—  
SECOHM, LONDON.

**FOR  
BRITISH  
MANUFACTURED  
PAPER  
INSULATED  
CABLES**

**THE  
UNION  
CABLE  
CO., LD**

**DAGENHAM DOCK,  
ESSEX.**

airway, should always be totally enclosed. Care must be taken that the men perform their respective duties adequately and regularly. Standardisation of machines, motors, and switchgear is highly desirable, and, in short, the persons responsible for the electrical side of the colliery should endeavour to attain reliability, efficiency, and economy.

### FAULT TESTING IN MINES

**M**R. E. E. BEADSMOORE, of the Notts and Derbyshire branch of the Association of Mining Electrical Engineers, has been reading an interesting Paper on "Fault Testing." In it he advocates no new methods or principles, and he has obtained good results on the application of both the loop and fall of potential methods of localising faults, using suitable apparatus, but he insists that the colliery electrician must have such instruments as a milli-ammeter and a milli-voltmeter, in addition to the usual switchboard instruments and the "megger." He has to be able, under the regulations, to locate faults as well as to find their existence. Among the examples given of actual faults located was one in which the resistance of the fault was 43,000 ohms; a loop test was used, and, in order to get enough current through the fault to obtain readings, a 500-volt megger was employed in place of a battery. The only other apparatus used in this last test was a sensitive low-resistance milli-ammeter and 25 ft. (300 in.) of resistance wire. This was connected between the two ends of the cable, as was also the milli-ammeter. One terminal of the megger was connected to earth, and the other to a wire which was moved along the resistance wire, to find the point at which no reading could be obtained on the milli-ammeter. This was found to be between 87 and 90 in. from one end (average, 88½ in.), so that test indicated the fault to be  $\frac{88}{100} \times 88\frac{1}{2} = 177$  yds. from the corresponding end of the cable loop. Actually there were found to be two faults a few yards away from the points indicated.

### MINING ELECTRICAL EQUIPMENT

**I**N the course of a Paper entitled "Electrical Equipment for Low Energy Consumption," read at the South Wales and other branches of the Association of Mining Electrical Engineers, Mr. J. Glynn Williams referred to a number of practical points in connection with mining electrical equipment. He spoke of good experience with Curtis high-pressure turbines, and, passing on to cables, expressed a preference for paper-insulated lead-covered double-steel-tape armoured cable on account of its better behaviour on short-circuit than bitumen insulated cable. A number of practical points on switchgear, motors, and controllers were recapitulated, and it was particularly insisted upon that stator reversing switches should be interlocked with controlling panel switches. For lighting he advised a 220-volt circuit with 40-watt drawn-wire lamps and conductors in ½-in. screwed conduit tubing. For underground lighting on main roads bulkhead fittings fixed in the centre of the roadway roof make a good job. The tubing should be run along the side of the road, and branches taken to a bulkhead fitting with a three-way junction box having a porcelain interior. This does away with joints, and saves cables. All fittings should be locked to prevent unauthorised persons tampering with the lamps. For such cases as inbye motor houses, lighting by portable alkaline accumulator lamps of 21 c.p. is suggested, taken in and out at the beginning and end of each shift.

At the end of the Paper some figures of energy consumption were given for a colliery with an output of 5,120 tons per week, where electricity is the sole motive power, generated from high-pressure turbo-alternators. The energy consumed per week is allocated as follows:—

	Total units for week.	Units per ton output.
Ventilation ... ..	20,160	3.94
Pumping ... ..	1,266	0.247
All surface and underground lighting, lamp-cabin motors for cleaning and charging accumulators ...	456	0.089
Screening ... ..	2,357	0.46
Haulage ... ..	6,042	1.18
Winding ... ..	6,548	1.279
	<u>36,829</u>	<u>7.195</u>

The units per ton mile for electric haulage and winding work out at 1.92. The author puts the lowest cost at which a colliery generating station could be run at 0.25d. per unit.



## A SIGNALLING SYSTEM FOR MINES

IN view of the coming into force on July 1st next of the Home Office order requiring all winding engines to be provided with visible signals, indicating the nature of the signal till it has been complied with, the following details of a system of mine signalling which has been brought out by the British Electrical & Manufacturing Co. (Athenaeum Street, Sunderland) may be of interest.

An outstanding feature of the system is simplicity of operation. All the signals are transmitted from one Morse key push, and an interlocking system insures that only one man can signal at a time to the engine-house.

The equipment in the engine-house consists of an indicator

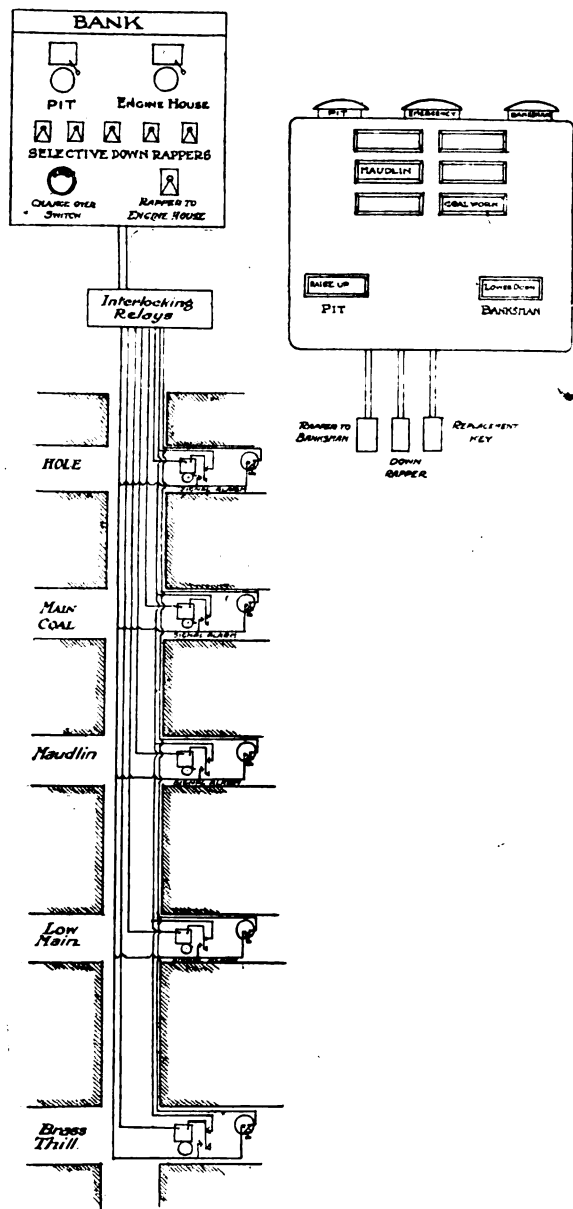


FIG. 1.—GENERAL ARRANGEMENT OF SYSTEM.

board, giving luminous signals showing from which seam the signal is transmitted, and showing whether coal is being worked or men riding, and containing a luminous signal controlled by the banksman, and revolving signal indications giving actual winding signal in accordance with number of rings. There is also one single-stroke pit-bell, one single-stroke bell of distinctive tone from the banksman, an emergency alarm trembler bell, a resetting switch worked by hand, foot, or automatically from the engine, a signalling push to the bank, and a "down-rapping" push enabling the engine-man to signal to the seam transmitting a signal to him. Interlocking relays are also provided, one for each seam circuit, and one isolating relay. The bank installation comprises a single-stroke pit-bell; a distinctive tone (single-stroke) engine-house signal-bell; selective down-rappers, one

for each seam; a change-over indicating switch (coal-work and men-on); an emergency alarm push, and a signalling push to the engine-house. Each seam is equipped with a Morse key signalling push, a single-stroke bell, and an emergency alarm push.

Fig. 1 shows the general arrangement, and Figs. 2 and 3 show the relays. Upon the on-setter in any seam signalling, say, four raps, viz., lower cage to low main, the first stroke on his push rings his own signal bell, and energises the left-hand coil (Fig. 2) upon the corresponding relay, and rings

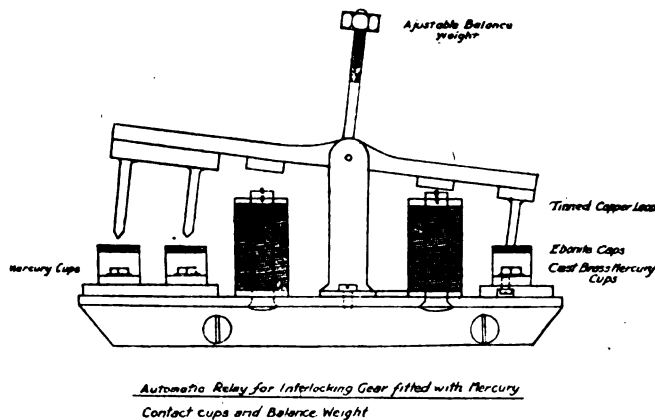


FIG. 2.—INTERLOCKING RELAY.

the pit signal bell. The relay closes the left-hand contacts and opens the right-hand contact.

The two right-hand contacts control circuits which respectively illuminate the seam indicator lamps and energise the left-hand coil on the isolating relay, thus opening all the other push circuits in the pit, leaving the on-setter signalling only in circuit with engine-house indicator, until the relays are replaced and the indicator cleared by the engine-house replacement key. The signal indicator consists of a light drum with mounted transparent linen signals painted thereon, the indicator moving with every stroke of the bell. A lamp is placed inside the cylinder. The bankman's pit signal bell is connected in parallel with that of engine-house, the bankman hearing all signals transmitted to the engine-house. The engine-man's indicator, upon receipt of the signal, would read "Coal work low main," and on moving indicator "Lower cage low main," four strokes sounding on both bank and engine-house pit signal bell. The engine-man, upon carrying out the signal, will immediately reset the apparatus by energising the right-hand coils of the relays. Any other on-setter attempting to signal fails to ring his own bell, thus knowing that he is cut out of circuit. In the event of the on-setter giving three rings, viz., "Men to ride," the same cycle of operations takes place, and the banksman will immediately

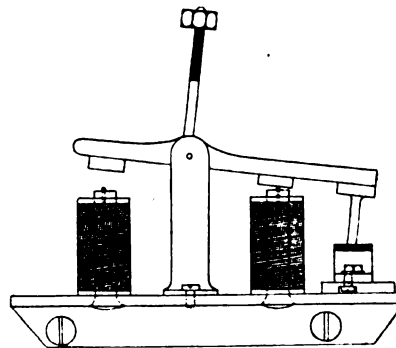


Fig. 3.

change over his switch, changing standing ("Coal-work") signal to that of "Men riding," which remains standing until returning to ordinary winding. He also signals to the engine-house on the push provided that he is clear, his signal being visually indicated, and also to the on-setter, ringing his bell, that he is ready; and the engine-man also signals to the bank on his push that he is ready; winding then proceeds in the usual way. The emergency alarm circuit is not interlocked,

all pushes being in parallel throughout, thus enabling any man to hold the cage in the event of any accident or emergency. The special down-rapping push enables the engineman to reply to any on-setter who has signalled to him through the medium of the closed interlocking relay. The cable required for this installation has four cores from the shaft bottom, and an additional one from each seam travelling upwards. The system can be designed to work with any voltage.

## ELECTRICAL MINING AND METALLURGICAL PATENTS OF APRIL

THE following specifications of interest to mining engineers have been published during the last month:—No. 14,427, of 1913, Fried. Krupp Aktiengesellschaft Grusonwerke, of Magdeburg-Buckau, Germany, describes a magnetic separator in which adjustment of the field strength is attained by the use of tapered poles, in conjunction with rotating disc armatures, which can be adjusted axially so as to alter the magnetic air-gap. Another patent relating to this subject is No. 9,725, of 1913, by H. H. Thompson, of Aldridge, Staffs., in which the armature is of the rotating drum-type, and is constructed of circular discs. Two sizes of discs are used in alternate order, so that the edges of the larger diameter discs project and form magnetic edges. This separator is particularly adapted for the separation of feebly magnetic material. F. Faerber, of Dortmund, Germany, describes in specification No. 16,467, of 1913, a combined miners' safety lamp and fire-damp detector. The latter is located inside the accumulator, which is made annular-shaped and is provided with slits, so that the detector, though visible, is protected from injury. Specification No. 9,321, of 1913, by A. Paxton, of Cardiff, relates to an improved form of safety lamp lighter. The lamp to be lighted is enclosed in a metal case, and a system of interlocking ensures that no ignition can take place until the lamp-case has been properly closed. A system is described in specification No. 25,975, of 1913, by J. H. Reineke, of Bochum, Germany, whereby it is possible to utilise the rails and pipes in mines for signalling purposes. Use is made of the fact that the galleries, though usually damp, are cut through dry rock, which is almost an insulator. A battery and microphone are used for transmitting, the rails are used as line wires, and the damp earth as return. The telephone receivers are of the ordinary type. A novel type of gong, giving a clear, unmuffled ring, forms the subject of specification No. 7,638, of 1913, by F. F. Macdonald, of Dinnington.

The following specifications, also published during April, will be of interest to metallurgists:—No. 6,161, of 1913, in which T. J. Craig and P. Spence & Sons, Ltd., of Manchester, describe a method of obtaining very finely-divided copper by electrolysis. The method is to employ a reducing agent in the electrolyte, so that as soon as the copper, which forms the anode, is brought into solution, it is precipitated as a fine powder by the reducing agent; this oxidised reducing agent is then moved to the cathode (which may be of lead) by stirring, and is there de-oxidised and rendered ready to assist in further precipitation. Ore-smelting by the use of induced eddy currents has hitherto been difficult of application, owing to the fact that these currents tend to confine themselves to the outer surfaces of the smelting bath. In specification No. 23,004, of 1913, S. Guggenheim, of Berlin, claims to have overcome this difficulty by arranging the bath between two or more pairs of magnet poles, so that several eddy current centres are formed which exert mutual influence and prevent the lines of force from being confined to the surface. It will, of course, be understood that alternating current is used to excite the magnets in question. Fried. Krupp Aktiengesellschaft, of Essen, give particulars, in specification No. 5,414, of 1914, of a curb-ring for the electrodes of electric furnaces. The electrode holder is arranged so that it can be adjusted horizontally and vertically, thus necessitating very little clearance between the curb-ring and the electrode.

"Wireless" Telephones in Mines.—Experiments are being made at the Lindsay Colliery of the Fife Coal Co. at Kelly with the Reinecke induction telephone which has been referred to in *ELECTRICAL ENGINEERING*, Vol. IX., page 555 (October 2nd, 1913), and Vol. VIII., "Mining Supplement," page lxxiv. Similar installations have been tried at Dinnington Colliery, near Rotherham, and the Astley Green Colliery of the Clifton & Kersley Coal Co.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,390.

What is the "heating time-constant" of a transformer? How can it be calculated from the design? Is it affected by alterations of load or the method of cooling?—J. H. B.  
(Replies must be received not later than first post, Thursday, May 14th.)

### ANSWERS TO No. 1,388.

An earth indicator is connected up as in Fig. 1 on a three-phase star-connected system supplied through a transformer as

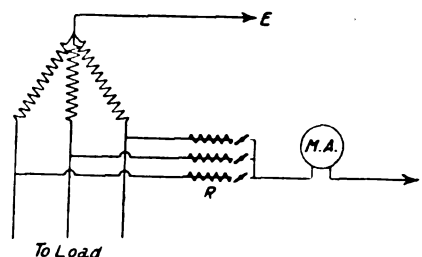


FIG. 1.

shown. What is the mistake? How ought the instrument to be connected? Explain its uses and action.—SPARK.

The first award (10s.) is made to "W. R." for the following reply:—

It is obvious, with an earth indicator connected up as shown in Fig. 1, that even if there is no defect in the insulation of the system, we shall get an earth indication due to the neutral point of the transformer being grounded.

The usual method of connection when the neutral is earthed is to connect an ammeter, as shown in Fig. 2; it will be seen that any leakage current will then be indicated on the ammeter.

Earth indicators are used in mining installations under

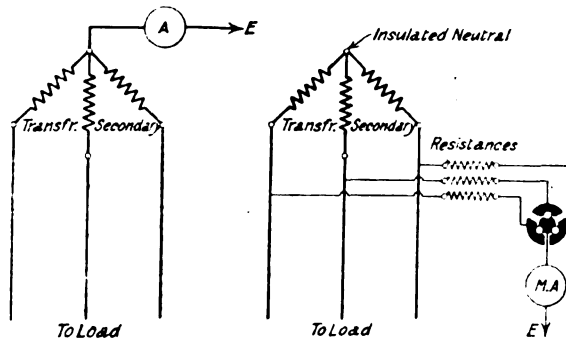


FIG. 2.

FIG. 3.

circumstances covered by the following extract from the Home Office Rules:—"Efficient means shall be provided for indicating any defect in the insulation of a system."

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The action of the instrument is as follows:—A milli-ammeter is used as the indicator in conjunction with a plug switch and three resistances (see Fig. 3) which are so proportioned that in the case of a bad fault giving full line voltage to earth the instrument would indicate the maximum reading on the scale. Under normal working conditions all three keys are in the plug, so that the earth indicator is kept in circuit permanently. If a fault occurs on one of the mains, a deflection is obtained on the milli-ammeter, and to determine on which phase the fault exists the three plug keys are taken out and tried one at a time, the faulty phase giving the smallest deflection.

The second award (5s.) is made to "G. C.," whose reply we give below in slightly abridged form:—

The diagram of an earth indicator, as shown by "Spark," is correct for a three-phase system where the neutral point is insulated, but as the neutral point is shown earthed the arrangement does not hold good. If one of the switches were to be closed it is equal to putting a load on the particular phase, as a circuit is at once made between one phase and neutral through  $R$ , and the readings on the milli-ammeter would be of no account.

A simple diagram would be as shown in Fig. 4, the resistance  $R$  being to protect the instrument in the event of a bad "earth." A more complex diagram is shown in Fig. 5, the principles of which are similar to Fig. 4, but a short-circuiting switch and an alarm bell are added. When the

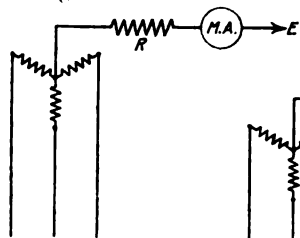


FIG. 4.

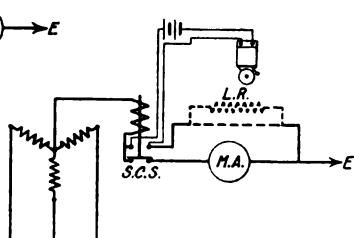


FIG. 5.

leakage current reaches beyond the range of the instrument the solenoid of the switch is attracted and automatically short-circuits the instrument, and also rings the alarm bell to warn the attendant of the presence of an earth. On large systems it is always advisable to switch in a limiting resistance to prevent putting a dead short across the phase in the event of a serious earth. This resistance is shown dotted in diagram Fig. 5. In both diagrams Fig. 4 and 5 the method does not discriminate the particular phase which is faulty, and one way of overcoming this is to put a switch in the neutral wire and open this switch when testing. The system can then for a time be considered as an insulated system, and the diagram as shown by "Spark" could be applied.

**The Institution Council Election.**—Balloting papers were issued last Friday, with the fortnightly "Journal," and have to be sent in to the Institution by to-morrow. In addition to the names published in our last issue, Mr. H. T. Harrison has been proposed by the following members: O. M. Andrews, A. W. Beuttell, A. W. Blake, W. A. Brown, T. Kerr-Jones, F. Pooley, N. W. Prangnell, C. N. Russell, A. H. Shaw, and E. Slater.

## THE "POINT FIVES"

A MEETING of the "Point Fives" was held at the B. & K. Restaurant, Earl's Court Road, S.W., on April 17th. Mr. Shaw (Worcester) and Mr. Furness (Blackpool) were elected members. It was announced that the next meeting was to be held during the M.E.A. week, on Thursday, June 18th. A supper will be held at the Grand Hotel, Birmingham, at 10 p.m., and the meeting will be held afterwards. The electric cooking works, testing rooms, laboratory and museum of the B. & K. Accessories Co. were visited, and an excellent electrically cooked dinner was partaken of.

The chairman's address by Mr. J. W. Hame (York) was read in his absence by Mr. S. T. Allen (Wolverhampton), and dealt with some of the author's experiences with various types of apparatus. In comparing the heating of ovens from the sides or the top and bottom, he said that when the joint was hung the former had advantages, but for meat cooked in drip-tins probably the latter was better. He did not think that glass windows in the oven doors were worth the extra expense, as their only utility was to view an internal thermometer, for very few people knew the correct temperatures. Many of the attached thermometers supplied were unreliable. Prominent current indicators such as illuminated glass discs, were valuable in preventing waste. Regarding utensils for use with hot-plates, he had good experience with the "Tricity" porcelain and the Carron brown-ware vessels, and for metal utensils found cast-iron with ground flat bases as good as anything. The B. & K. table cooking appliances had the advantage of one cord connector being usable with any utensil, and had proved satisfactory. There were always difficulties, however, in wiring leads conveniently to a table away from the wall, and he suggested that central indirect lighting fittings should have special connectors fitted at the bottom of the inverted bowl for the purpose. He criticised the finish of a particular make of electric fire, and in conclusion urged that electricity should be used more than it is for private washing and laundry purposes, in addition to ironing. When wiring houses, as much wiring as possible should be included to which sockets and plugs could be afterwards connected.

The discussion was opened by Mr. J. W. Beauchamp (West Ham), who thought that inspection windows were useful; two were desirable with an external lamp opposite one, as lamps inside the oven soon failed. Mr. W. Pickvance (Wrexham), who spoke later, also favoured windows, as he did thermometers, but found that internal lamps lasted well, but Mr. Farndon (West Ham), and Mr. Allen were against their use. Mr. P. E. Rycroft (Heston and Isleworth), considered that the electric iron was the best introduction to domestic uses of electricity, and suggested giving irons to consumers as a substitute for discounts. Mr. W. H. Cooke (Luton), preferred side to top and bottom heating, an opinion shared by Mr. W. Travis (Brompton and Kensington), who advocated a central research bureau in electric cooking. Radiant heat was best for roasting, and "black" heat for pastry. Several speakers regretted that the water-boiling problem had not been treated in the address. Mr. Allen praised the Belling type of heater, and considered aluminium utensils with ground bottoms the best, the bottom was slightly concave when cold, but flat when hot. He wired a heating circuit and plug at a rental of 1s. per annum to encourage the heating load. Mr. A. Nichols Moore (Newport) had found that pressure variations affected cookers more on D.C. than on A.C. circuits. Mr. R. S. Downe (Brompton and Kensington), spoke of the desirability of familiarising the public with cooking otherwise than by coal, and thought that it was well worth while standardising cookers and ovens. The average consumption of a number of complete family cooking outfits in his district was  $1\frac{1}{2}$  units per head per day. Mr. F. Fardon, who was one of several speakers who were enthusiastic in supplying irons on trial as an introduction to domestic uses of electricity, described a new pattern of plug which has been developed by A. P. Lundberg & Sons, in conjunction with the West Ham staff, the main features of the apparatus being the contact pins and terminals, which are made in one solid piece, two set-pins being provided in the terminal for securing good contact with the flexible wire, thus overcoming the possibility of over-heating at the joints forming the contacts on the usual type of plug. The plug top is made in halves, clamped together by means of brass set pins, the result being to form a cord-grip on the braiding of the flexible wire. Mr. A. H. Seabrook (Marylebone), referred to the desirability of developing a thermostatic control of oven heating which would do away with individual switching, so that the cook had simply to turn a pointer to the temperature required, and the thermostat would maintain the oven at that temperature. He firmly believed in properly illuminated indicators, showing the position of switches. He did not consider fixing the switches and fuses on the cooker was good practice.

They should be mounted on a separate control board. He agreed with the author that cast-iron pots with turned bottoms proved the best for hot-plate heating. He emphasised the necessity of fixing to each cooker, either a rapid boiler or a separately heated kettle for small quantities of water required quickly. Either of these heaters would supply hot water at a quicker rate than was obtainable by gas.

## THE ELECTRICAL CONTRACTORS ASSOCIATION

THE annual banquet of this Association took place on Wednesday, April 29th, at the Grand Hotel, Leicester. Mr. S. H. Webb, the President of the Association, presided, and his name was coupled with the toast of the Association proposed by Mr. Councillor Squire, of Leicester. In the course of his remarks, Mr. Squire said that electrical contractors could deal with matters affecting their trade much better as an association than individually, and that the Association had done a great deal towards maintaining the dignity of the trade and upholding a high standard. Their President was a working President, who had visited almost every branch of the Association. In the course of his reply, the Chairman maintained that municipal bodies ought to be limited in their scope by the question as to whether the community as represented by the municipality could render better service than private enterprise, or only equally well. In the latter event the municipality ought not to step in. Other points referred to were Mr. Marryat's guarantee of work scheme, which the Chairman said would attach more value to the letters "E.C.A.," and the I.M.E.A. Bill.

Mr. E. C. Wallis proposed the toast of the Institution of Electrical Engineers, the Association of Municipal Electrical Engineers, and Kindred Associations, which was replied to by Mr. T. R. Smith, Borough Electrical Engineer of Leicester, who gave some figures and information relating to the Leicester Corporation Electricity Works, and Mr. W. H. Allen, Borough Electrical Engineer of Loughborough. Mr. Councillor H. L. Harrison, of Hull, Chairman of the Northern Section of the E.C.A., proposed the toast of the President, to which Mr. Webb replied. Mr. Hurley then proposed the health of the Secretary, Mr. L. G. Tate, and in replying Mr. L. Tate referred to his work in connection with the Association as a work of love. An excellent musical programme was arranged by Mr. W. Grocock, F.R.C.O., L.R.A.M.

## ELECTRIC TRACTION NOTES

Col. E. Druitt's Board of Trade Report on an accident which occurred on the Rochdale Tramways on February 14th, when a car attained a high speed descending an incline, and subsequently left the rails on a curve, colliding with a tramway standard and dashing into a shop window, has now been issued. The inspector attributes the accident to the driver allowing too high a speed to be attained before applying his magnetic brake sufficiently, and when putting it on the last notch suddenly skidded the wheels. It was impossible to find whether there was any defect in the brake control owing to damage done by the collision, but it is stated that the driver had not previously tested the brake. The design of the sand-boxes is criticised.

In the course of a discussion in the Dover Council on the rates to be charged by the Electricity Department to the Tramways Department for current used by the tramways, it was stated that the use of meters on the cars had led to such economy in current consumption that the total amount was reduced below the figure at which a reduced charge per unit was made, and therefore energy was charged for at 2½d. per unit, instead of 2½d. which had been the charge during previous years, when, without meters, the consumption was greater. A motion to charge at the 2½d. rate was defeated.

The Bristol Corporation Tramways Bill, which proposed to give the Corporation authority to work the undertaking of the Bristol Tramways Co. when it should be acquired by the Corporation under the provisions of the Tramways Act, was considered by a House of Lords Committee last week. After a considerable amount of evidence, the Committee decided that the Corporation must make up its mind either to purchase the tramways, which it has the option to do in May next year, or to drop the present bill and come to Parliament at a later period, when it had made up its mind on the question. As the bill was originally drafted, the Corporation was not under an obligation to purchase the tramways.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Demonstrations have been given this week before some Russian officers, between Marconi House and the Savoy Hotel, of the new system of wireless telephony which Mr. Marconi has lately been at work on. It is understood that this system, with which many successful experiments were recently made on Italian warships, is being introduced into the Italian navy, and is being considered by other foreign Powers. It is described as a simple, practical system, with apparatus of small power, and, as at present constructed, will send messages between fifty and a hundred miles or more. With larger apparatus it is anticipated that longer distances will present no obstacle, and that a wireless telephone service from London to New York should be practicable.

The Postmaster-General, in his speech last Thursday introducing the Post Office Estimates, stated that the chief cause of the increased figure (£26,150,000) which he had to put forward (an increase of £1,770,000 over that of last year) was the rise in salaries of Post Office employees. He mentioned that the telegraphs were run at a loss of £350,000, but that there was a profit of £300,000 on the telephone service. On the average, every 6d. telegram cost 11d. to send. He hoped that some of the telegraph expenses would be lightened by replacing this service in part by the telephone. He spoke of the rapid development of the telephone service, and the difficulty in training workers to look after it in sufficient numbers. The telephones in London had increased by 13,000 in a year, and were now 243,000 in number. He hoped this year to open four new exchanges, and to spend £750,000 in extensions in London and £1,650,000 in the provinces during the coming year. The intertown communication system, as used between Liverpool and Manchester, was to be applied to Leeds and Bradford. Automatic exchanges were in progress at Accrington, Darlington, Stockport, and Leeds. If these were successful they would be introduced all over the kingdom, and eventually, if possible, in London. He was unable to make an announcement regarding the new telephone charges. With regard to wireless telegraphy, Mr. Hobhouse said that he hoped to rearrange wireless stations for internal communication in a manner leading to extensive developments and cheaper communication. There were nine ship-to-shore stations, and more were coming into existence at Valencia and Stonehaven. Erection of one of the home stations for the Imperial wireless stations was begun, and sites were acquired at Cairo. The Indian station was to be at Pooná. These were to be established by the Marconi Co., but the Post Office was still free to hand over the others to any other company.

The Local Government Board has sanctioned a loan of £192,428 for the purchase of the National Telephone Co.'s plant in the Hull area from the Postmaster-General. The period of repayment is to be nineteen years. The purchase was completed yesterday.

At the meeting of the Indo-European Telegraph Co. it was announced that the additional circuit from London to Teheran was now an accomplished fact, and would shortly be linked up to the additional wire to Karachi.

The Bagdad-Bassorah line has been restored, as well as the Persian line, between Behbahan and Abwaz.—The Mexican lines were restored on April 29th to Mexico City *via* Salina Cruz, and also to Coatzacoalcas and Tehuantepec.—The *via* Galveston route is also again available.—Private telegrams in clear and code language are also once more admitted to Vera Cruz.—The Saigon-Bangkok line was down on May 1st, and on the 5th inst traffic for Siam "*via* Moulmein" was subject to long delay, owing to the bad condition of the lines.

**A Claim for Commission.**—At the Lord Mayor's Court on Friday, a claim was made by Messrs. L. Cahn & Co., stock-brokers, against the Dubilier Syndicate and M. Mclean for commission alleged to be due in connection with an introduction which led to licences under certain patents of the Syndicate being taken up by the General Electric Co.

**Charging Tariffs for Electric Vehicles.**—The suggestions of the Electric Vehicle Committee regarding prices for motor vehicle battery charging have been adopted at Marylebone, Stoke-on-Trent, and Heston and Isleworth. The charge is to be 1d. per unit during non-peak hours, or ½d. between 11 p.m. and 6 a.m., by special arrangement, with a minimum of 2s. when cars are brought to the station. A discount of 20 per cent. is given for current purchased for resale, and in the case of Marylebone there is a special scale of discounts for large consumers.



## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published April 30th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

**7,898/13. Increasing Strength of Magnets.** P. MAY. A method of increasing the magnetic flux beyond the ordinary point of saturation by heating the core of the magnet at suitable points. A horse-shoe magnet is heated at the bend; a bar-magnet, at the middle. Heating may be effected either directly, or by the eddy currents induced by an A.C. coil wound round the core at the desired place. It is claimed that the magnetisation can be increased about 30 per cent. by this means.

**8,249/13. Train Control.** E. C. R. MARKS (*E. G. Mascarenhas*). This method of preventing trains from overrunning signals is used in conjunction with the make and break, controlled from the semaphores in the ordinary signalling system. Short contact rails are provided at sides of track, and contact levers are provided on the engine to engage with these rails. A solenoid on the engine controls the operation of the air valve for braking. This solenoid is energised either through a relay, when the external circuit, containing the semaphore make and break, is in the danger position, or by the action of a centrifugal governor which closes the circuit when the train speed exceeds a certain safe maximum. If, however, the speed of the engine is below a certain value, the solenoid circuit is kept open by the governor, so that the train can pass the danger signal provided its speed has been reduced sufficiently. Eleven figures.

**11,017/13. Preparation of Ductile Tungsten.** WESTINGHOUSE METALLFADEN GLUHLAMPENFABRIK GES. This process consists in heating the metal to a high temperature and allowing it to cool slowly under pressure, *e.g.*, introduce the metal into a molten mass or heated mould, which exerts the desired pressure on cooling. Sintered tungsten is mixed with a quantity of thermit and ignited. To prevent the tungsten being dissolved, it may be enclosed in a tube of refractory material or covered with an infusible oxide, or the metal used for exerting the desired pressure may be saturated with tungsten. The process is also applicable to molybdenum.

**26,442/13. Speed Regulation of Rolling-mills.** W. R. WEBSTER. The relative speeds of two rolling-mills are regulated so as to keep a constant tension in the stock passing between them. One of the mills is fixed, the other is mounted on slides. The distance between the mills is regulated by a plunger working in a pressure chamber. Variation in the relative speeds of the motors will cause the movable mill to change its position on the slides. This motion operates a rheostat which corrects the speed of the movable mill and brings the tension in the stock back to normal. Two figures.

**29,059/13. Sparking Plug.** C. SPADA. The points of the plug can be cleaned whilst the engine is running. One electrode is in the form of a central vertical spindle, and the other is formed by inward projections from the body of the plug. The vertical electrode is held in position by a spring, and cleaning is effected by depressing the spindle, so as to bring the two electrodes together, and rotating. Five figures.

**895/14. Automatic Telephone System.** WESTERN ELECTRIC CO. (*F. T. Woodward*). The principal feature of this specification is a device to impress a "ringing" tone upon the calling line so that the caller will know that the called line is being signalled. A "busy" tone is produced upon the calling line if the desired line is engaged. These two devices are located at the first selector switch through which communication may be established. Five figures.

**6,353/14. High-pressure Arc Lamp.** E. WEINTRAUB. In this lamp the anode is a flat spiral of tungsten wire, and the cathode, mercury. Precautions are taken to prevent condensed mercury falling on to the anode. The voltage required for starting the arc is less than the normal working voltage.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** BRYAN, GOLDING, and PEARCE [Arc lamps for projection apparatus] 8,968/13.

**Dynamos, Motors, and Transformers:** WHITE and BACON [Brush-holders] 9,094/13; HUNT and SANDYCROFT, LTD. [Dynamo-electric machines] 9,260/13, 9,261/13; GIRARDEAU [High-frequency generators] 12,809/13; B.T.-H. Co. and BROWN [Electrical driving of reciprocating machinery] 14,049/13; B.T.-H. Co. (*G.E.C., U.S.A.*) [Electric transformers] 18,663/13.

**Electrometallurgy and Electrochemistry:** S<sup>oc</sup>. G<sup>énérale</sup> DES NITRURES [Heating of electrical furnaces] 24,347/13; BRONN and SCHEMMANN [Protecting furnace electrodes] 29,259/13.

**Ignition:** EICHBAUER [Ignition device for bombs and explosive mines] 8,371/13; VARLEY [Starting and igniting systems for the engines of motor vehicles] 8,679/13, 119/14.

**Incandescent Lamps:** DOWNES and VENNING [Cut-outs for instruments, glow lamps, &c.] 9,100/13; GARDE [Candle lamp] 24,130/13.

**Switchgear, Fuses, and Fittings:** HOPE and THOMAS [Enclosed switches] 9,212/13; MILLER and BOOTHMAN [Regulating switches] 5,505/14.

**Telephony and Telegraphy:** McKENNA (*Fankhauser*) [Telegraphones] 5,958/13; JENNINGS [Loud-speaking telephone] 9,904/13; SIEMENS and HALSKE A.-G. [Circuit arrangements for automatic and semi-automatic telephone systems] 14,487/13, 29,049/13, 1,792/14; THOMPSON (*Soc. Anon. des Télégraphes Edouard Belin*) [Resistance device for microphones and the like] 17,562/13; HADDAN (*Reineke*) [Relays for weak, undulating currents] 22,943/13; EASTERN TELEGRAPH CO. and RYAN [Duplex telegraphy] 25,591/13; MILLERSH-JACKSON (*Signal Ges.*) [Radio-telephone stations] 27,175/13; FADER and TIBB [Call registering telephone] 29,864/13.

**Traction:** HARTFORD and MASTRANGEL [Electrical installation for motor vehicles] 8,792/13; JOHNSON [Automatic signalling devices] 26,358/13.

**Miscellaneous:** ROLFE [Field magnets] 1,222/13; WALL [Electrically operated drill] 9,893/13; BLOXAM (*Oesterreichische Siemens-Schuckertwerke and Regal Patente Ges.*) [Picture-reproducing machines] 10,460/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, &c.:** SOC. ANON. LE CARBONE [Electrical connections] 8,695/14.

**Dynamos, Motors and Transformers:** LJUNGSTROM [Electrical machines] 4,979/14; ALLMANN SVENSKA ELEKTRISKA AKTIEBOLAGET [Alternating current machines having bar winding] 8,565/14; SOC. ANON. DES AUTOMOBILES and CYCLES PUGBOT [Electric lighting plant control] 9,175/14.

**Telephony and Telegraphy:** FRATELLI MARZI DI G. B. [Microphones] 2,624/14; SIEMENS and HALSKE AKT.-GES. [Circuit arrangements for telephone systems] 8,800/14.

**Traction:** YSEBODT [Block signalling apparatus] 8,983/14.

**Incandescent Lamps:** BENJAMIN [Lamp sockets] 7,298/14.

**Miscellaneous:** A. E. G. [Feed mechanism for type-writers] 4,357/14; SPRENGER [Electric heating devices] 8,719/14.

The following Amended Specifications may now be obtained:—

**Arc Lamps:** BLONDEL [Arc lamps] 4,677/06.

**Traction:** INTERNATIONAL P. A. Y. E. TRAMCAR CO. [Railway and similar vehicles] 14,584/12.

### Restoration of Lapsed Patent

**26,042/07. Fire Indicator for Ships.** An order has been made, restoring this patent to W. Rich. Air is drawn, by an electric fan, through a number of pipes, from different parts of the ship, and led to an observation box. Smoke issuing from one or more of the pipes indicates fire. The fan is driven intermittently by an electric motor, which is switched on at intervals by clockwork. An electric lamp is included, so that the apparatus can be used at night. Provision is also made for extinguishing the fire by blowing steam down the pipes.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors and Transformers:** W. E. LAKE (*Bissel Co.*) [Self-contained arrangement of motor and controlling mechanism] 758/09; SIMMS [Safety spark-gap device for brush holders of h.t. machines] 1,263/09; LAKE (*Bissel Co.*) [Controller for small motors] 13,734/09.

**Instruments and Meters:** SIEMENS BROS. [Maximum demand indicator] 878/08.

**Switchgear, Fuses and Fittings:** E. A. CAROLAN (*G.E.C., U.S.A.*) [Combined switch and cut-out for high-tension lighting systems] 1,066/05; B.T.-H. Co. (*G.E.C., U.S.A.*) [Three-pole circuit-breaker with overload and no-load release] 952/06; MORRIS and ATR. [Quick-break switch] 1,354/07; BRACKENSIECK [Automatic interrupter for electric signs] 16,885/09.

**Telephony and Telegraphy:** STOLZ [Telephone for the deaf] 13,875/08.

**Traction:** B.T.-H. Co. (*G.E.C., U.S.A.*) [Series-parallel motor control for petrol-electric or steam-electric cars] 1,279/07; MUNRO [Trolley head for overhead conductors] 1,077/09.

**Miscellaneous:** G. S. TIFFANY [Electrically operated clock with compensated pendulum] 1,258/04; W. M. BARNES [Ironing machines] 1,284/06; LOEHL [Electrically illuminated clocks] 785/09.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 263. —

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### CATALOGUES, PAMPHLETS, &c., RECEIVED

**BATTERY CHARGING GENERATORS.**—The subject of small generators (from 0.22 to 2.52 kw.) for the charging of 50- or 100-volt batteries is dealt with in a new illustrated pamphlet from the British Thomson-Houston Co., Ltd. (Rugby), who have standardised a special line of machines for the purpose, the good points of design of which are fully set forth in the specification contained in the pamphlet.

**METAL FILAMENT LAMPS.**—An effective coloured postcard from the Edison & Swan United Electric Light Co. (Ponder's End, Middlesex) reproduces a striking poster design, in which Aladdin is carrying a Royal Ediswan drawn-wire lamp nearly as big as himself, which is indeed wonderful in that it is brilliantly illuminated without being connected to any circuit.

**DIAMOND DIE POLISHING MACHINES.**—A pamphlet from Werths & Co. (41 Aldersgate Street, E.C.), describes the Poppe patent automatic machine for polishing diamond dies for wire drawing. This machine can polish 10 dies at once with an accuracy unattainable by the older methods. A number of these machines are in use at drawn wire lamp factories at home and abroad.

**HOLOPHANE FITTINGS, &c.** A new leaflet from Krupka & Jacoby, Ltd. (26 to 36 Chapter Street, Westminster, S.W.), illustrates a number of special fittings for use with holophane glassware, including galleries for carrying these reflectors.

**FANS.**—A full line of electric fans, including a new inexpensive design of 12-inch D.C. swivel and trunnion pedestal fan, is dealt with in another list from the same firm.

**TELEPHONES.**—A hygienic glass telephone mouthpiece is dealt with on a card from the Sterling Telephone and Electric Co., Ltd. (210-212 Tottenham Court Road, W.).

**WIRELESS TELEGRAPH APPARATUS.**—A new catalogue of wireless telegraph apparatus, suitable for equipments of great variety of styles and sizes, has been issued by A. W. Gamage, Ltd. (Holborn); complete portable and other sets are listed, as well as a large range of separate pieces of apparatus, accessories, &c. With this list we have received a copy of the second edition of Gamage's Directory of Experimental Wireless Stations in the United Kingdom.

**STRIP LIGHTING.**—A leaflet from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), gives notice of reduced prices for both the "Narro Striplite" and "Aluminium Striplite" reflectors for strip lighting by tubular lamps.

**Visit to the Ediswan Works.**—The members of the University of Birmingham Engineering Society paid a visit on May 1st to the works of the Edison & Swan United Electric Light Co., Ltd. In the Lamp Department visitors were shown glass making, bulb blowing, tube drawing, manufacture of carbon filaments, flashing filaments, preparing and mounting metal filaments, jointing filaments, stem making, sealing-in filaments, exhaustion of lamps, capping, stamping and testing of the finished lamp, and the new half-watt lamp was also seen alight. In the Engineering Department the complete manufacture of high and low tension switchboards, circuit breakers, oil switches, transformers, generator rheostats, motor control gear-holders, switches, plugs, and other electrical accessories was inspected, and the turret shop, brass shop, and foundry were visited, and the complete manufacture of electrical fans, and a great variety of electrical heating apparatus, including all forms of the Bastian radiators, was witnessed, as well as that of electrical piano players and other interesting articles. Tea was served in the general offices, after which Mr. J. G. Pearce, the Members' Secretary, expressed a vote of thanks for the educational value of the visit and their cordial reception. Mr. E. Gimingham replied on behalf of the directors and staff.

### INEXPENSIVE SEMI-INDIRECT FITTINGS

WE illustrate here two new fittings for semi-indirect lighting which the British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.) have recently added to their already long series. One of these fittings consists of three chains, a ceiling plate, and a ring to support the opal bowl. The fitting, although simple, is of graceful design. These fittings are made for single Mazda lamps, or for clusters of four or six, and in diameters ranging from 10 in. to 19 in. The prices range from 17s. 6d. upwards,

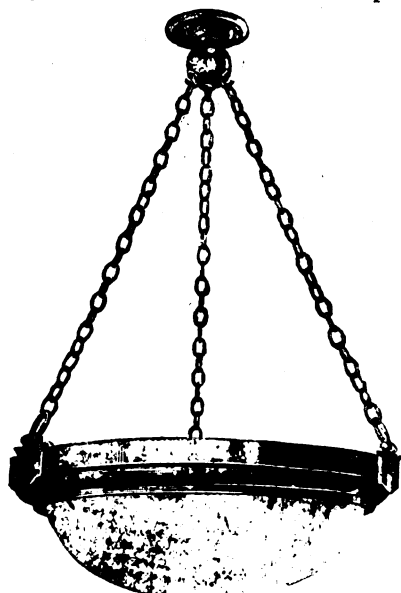


FIG. 1.—SEMI-INDIRECT FITTING WITH SHALLOW OPAL BOWL FOR 4 TO 6 LAMPS.

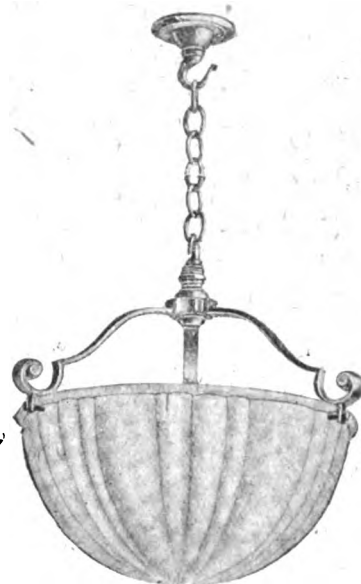


FIG. 2.—SINGLE LAMP SEMI-INDIRECT FITTING WITH VELURIA HEMISPHERE.

complete with glassware and lamp-holders. The other fitting is almost as inexpensive, the prices in this case ranging from 18s. This employs a Veluria hemisphere reflector bowl, and is made either with central chain or tube suspension. The glassware is held by means of thumbscrews on three arms radiating from the central suspension. Veluria hemisphere fittings are supplied in various diameters to take single Mazda lamps of from 30 to 400 watts.

**Half-watt Lamps for Exhibition Lighting.**—The main lighting for the Bristol International Exhibition is to be effected by half-watt lamps, which will be employed exclusively by the Electrical Engineering and Equipment Co. (109-111 New Oxford Street, W.C.), who have the contract for the whole of the electrical work, both lighting and power, including switchgear, mains, feeders, and services, outside and interior lighting. The firm write us that since the advent of the half-watt lamp they would not think of using arc lamps for an installation like this, owing to the trouble and expense entailed by their cleaning, re-carboning, and general maintenance. They claim to be the first firm in this country to carry out an important lighting installation of this kind with half-watt lamps.

**Condenser Protective Gear.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have concluded arrangements to supply the Moscicki condenser and Giles valve for this country, in those cases where the protective gear forms part of the general scheme of switchgear. For South Africa, China, excluding Southern Manchuria, Australia, and India, they have the sole right of sale and representation. The General Electric Co. are now prepared to quote for such gear for the protection of overhead and underground lines and power houses against lightning surges, pressure rises, and similar contingencies, embodying these special schemes of protection, in addition to their Standard Lightning Arrester equipments, which are now in use all over the world.

# NEVER BEFORE

HAS

Such a Practical  
Such a Useful  
Such a "Just What's Wanted"

article as

## The New "BELLING RING"

(Reg. Design 634,028, patent applied for)

Been put on the Market.

IT DOES ANYTHING the ordinary gas ring does—just as quickly—and more economically.

IT BOILS (2 pints in 6 mins.)  
IT TOASTS (4 pieces per minute.)  
IT FRIES. IT GRILLS.

Using all the ordinary existing Kitchen Utensils.

It does not matter what's spilt on it—Water, Grease, Dirt,—nothing does it any damage.

We guarantee it for one year of average household use,  
—it will probably last for three.

IT IS THE QUICKEST SELLER  
ever yet introduced to the Electrical business.

ITS OBVIOUS UTILITY ensures INSTANT PURCHASE.

Do you realize that with a little effort you could easily  
Sell one of these Rings straight away to, say, 50% of  
your Consumers?

JUST WORK OUT WHAT

EARLY MORNING LOAD  
THIS WOULD CREATE!!!

Everyone would Boil their Kettle for the Early Morning  
Tea. Two Rings would Cook all the Breakfast.

PRICE — 6-inch Ring 1500 watts, complete with control  
panel, fitted with switch, fuse, and terminals for mains,  
22/6 subject.

### SEND FOR A SAMPLE AT ONCE

TAKE IT TO PIECES (by removing just 8 screws), examine its entire construction, remember that the perforated top is made from solid nickel chromium (so that it does not flake away or oxidize) and you cannot but be convinced of its reliability.

It is made on our patented construction of running a non-corroding wire in FREE AIR, and supported at suitable intervals by projection from a refractory fireproof base underneath. The channels in this base carry off any liquids accidentally spilt on the wire.

There are no "air pockets," no points of "bad heat conductivity," no "uneven temperatures" or strains on the resistance wire—in fact no excuse of any kind for breaking down.

You know who we are—  
You know our usual lines of business—  
You know we have maintained a high standard  
in our goods—  
You know we have done exceeding well with  
"Fires" this last Season.

DO YOU THINK WE SHOULD RISK  
OFFERING YOU A NEW ARTICLE  
WHICH WE WERE NOT PERFECTLY  
SURE WAS A SOUND ONE?

Write us, 'phone us, OR COME AND SEE US, the latter for preference. We are ordinary people, with simple ways, and we like to discuss practical points with practical men. Our acting Partner, Mr. C. R. Belling, is always personally at your service.

## BELLING & CO.

Electric Cooking and Heating Specialists,  
EDMONTON - - - LONDON, N.

P.S. We also have a fine line in "Grillers."

### HOTEL LIGHTING

ONE instance of the many ways in which Osram half-watt lamps can be effectively employed for attractive outside lighting is afforded by an installation at The Mitre Hotel, Tooting. Here three Osram half-watt lamps have displaced



A HALF-WATT LAMP INSTALLATION.

the arc lamps previously used, and, as may be seen from the illustration, a remarkably striking effect is produced. The lamps look well in the General Electric Co.'s "Vintner" lanterns, which are of one of the extensive range of specially-ventilated lanterns designed for use with these lamps. Each of the lamps is of the 500-watt size, requiring 65 volts, so that the three are conveniently run in series. The work was carried out by Mr. A. R. Ashmore, Electrical Engineer, 4 Station Parade, Balham, S.W.

### AN ELECTRICAL ADVERTISING DEVICE

WE had the opportunity of inspecting, at the recent Advertising Exhibition in Holland Park Hall, London, some ingenious machines in which electricity is utilised in the attractive display of advertisements. The Graham-King Auto-Electric Advertisers take the form of a compact cabinet, through the glass front of which various advertisements are made to appear at intervals. The mechanism, which ran very sweetly, was driven by a  $\frac{1}{10}$ -h.p. D.C. motor, and consists essentially of a revolving drum driven by friction rollers through worm-gearing, and carrying at each end arms for lifting the posters into position ready for passing over the drum to the front of the cabinet. Two strip lamps are situated at each side of the displayed poster, but invisible from the front, and these are switched on automatically as soon as each poster is in position. The arrangement of the posters in the cabinet assists the effective illumination, and the effect is that of a framed picture. A clock is fitted immediately above the front of the cabinet, and serves the double purpose of drawing attention to the machine and switching the motor into and out of operation at the desired times. The standard cabinets will take thirty-two posters of either crown, double crown, or double royal size, but we understand they can also be built to special requirements.

**New Showrooms.**—The Edison & Swan United Electric Light Co., Ltd., advise us that they will be opening new West End showrooms at 71 Victoria Street next week. These will contain an extensive show of all Ediswan electrical accessories, "Royal Ediswan" drawn-wire and carbon lamps, electric heaters, fans, fancy fittings, glass ware, suction cleaners, flat irons, cooking utensils &c.

**"Rands Plant."**—This is the title of a new monthly periodical, price 2d., which is being published by Paul W. Rands, Caxton House, Westminster, and forms a register of plant for sale at low price, and ready for immediate dispatch. A large number of motors, dynamos, complete generating sets, engines, boilers, various electrical and engineering goods and also motor-cars, are offered for sale.

**Electric Signs.**—In a case last Thursday Mr. Justice Astbury was called upon to decide whether the erection of an electric sign on a certain building at the corner of Shaftesbury Avenue and Piccadilly Circus, was prohibitable on the ground of being an alteration in the elevation or architectural decoration, under the terms of a London County Council lease. His Lordship held that such temporary advertisements, which could be removed at any time, did not constitute a breach of the covenant in question.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Bexhill.**—£2,500 is to be spent on feeders and distributors to an outlying district, and a booster.

**Bexley.**—The U.D.C. invite tenders for controllers, &c. (See advertisement on another page.)

**Devonport.**—Cables, wires, and meters. Form of tender from J. W. Spark, Borough Electrical Engineer, Newport Street, East Stonehouse. Tenders by May 12th.

**Hindley.**—Tenders are invited by the U.D.C. for four-core L.T. lead-covered and armoured cable, joint-boxes, and feeder pillars. Particulars from O. P. Abbott, Council Offices. Tenders by May 18th.

**London: Hampstead.**—It has been decided to put in additional plant at the station at a cost of £7,600, to extend the mains (£2,604), and to erect a new sub-station (£1,068).

**Lytham.**—As reported in our issue for April 23rd, Lytham is to take a supply of electricity in bulk from St. Anne's-on-Sea. A Local Government Board inquiry to sanction a loan of £23,700 by the Lytham Council has been held. The initial expenditure will only be about £10,000 for three transforming stations and mains.

**Rotherham.**—A Local Government Board inquiry was held last week with regard to an application for sanction to borrow £19,956 for extensions. The estimate includes a 2,000-kw. alternator (£7,350), steam piping (£1,536), 1,000-kw. rotary and transformers (£2,600), switchgear and cables (£1,250), overhead crane (£300), and mains extensions for three years (£6,000).

**West Bromwich.**—Tenders are to be invited for a storage-battery and booster at the electricity works, at a cost not exceeding £5,000.

**York.**—The Electricity Committee has approved a report by the City Electrical Engineer, Mr. Hame, recommending a 1,000-kw. high-tension feeder on the solid system to a new sub-station at a cost of £5,500; a rotary-converter sub-station at about £3,000; further mains and transformers required during the next twelve months at £3,700; £3,000 for new services during the future, and £1,500 for a rotary-converter and transformers at the generating station.

### Wiring

**Belfast.**—Steps are being taken to ascertain the probable cost of lighting St. Jude's Church. Rev. Canon Davis, M.A.

**Bognor.**—The electric lighting of the Western Esplanade Gardens and Bandstand has been decided upon.

**Edinburgh.**—Electric lighting, power, telephone, and bell work for hostels for women students. J. King, M.A., Provincial Training College, Moray House. Tenders before May 20th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barrow.**—New schools at Victoria and South Vickers Town. Education Committee.

**Bristol.**—Central premises for Y.M.C.A. Architects, Oatby & Lawrence.

**Dudley.**—New town hall, police buildings, school extensions, and hostel for training college. Town Clerk.

**Edinburgh.**—Cinematograph theatre in Portobello. Central Picture House Portobello Co.

**Manchester.**—Cinematograph theatre in Oxford Road. Architect, P. Hothersall, 426 Bury New Road, Prestwick.

**Powell Duffryn.**—360 dwelling houses for the Powell Duffryn Steam Coal Co. E. M. Hann, Aberdare.

## TENDERS RECEIVED AND ACCEPTED

**Bolton.**—Tenders have been accepted for six Balcke air filters, also for Ferranti single-phase transformers, and Alexander Wright CO, recorders.

**Gloucester.**—The tender of British Insulated & Helsby Cables, Ltd., has been accepted for cables for the coming year, at £630. Fifteen other firms tendered.

**Heston and Isleworth.**—Isaria, Ltd., have obtained an order

for 10 to 100 ampere D.C. ampere-hour meters, and prepayment meters.

**London: L.C.C.**—The G.E. Co.'s tender for lighting the central car repair depot and the Abbey Wood car shed, at £217, has been accepted. The other tenderers were Edison & Swan Co., at £223; and Armorduct Manufacturing Co., at £224.—The B.T.-H. Co.'s tender for carbon-filament lamps during 1914 has been accepted by the Stores and Contracts Committee.—We announced in our issue of March 5th that, in connection with the tenders for metal-filament lamps, "other than drawn," two tenders for foreign lamps had been passed over, and the lowest tender for lamps of British make had been recommended for acceptance. The Committee reports that since then circumstances have been brought to its notice, which, in its opinion, render it undesirable at the present time to accept any of the tenders received.—Messrs. Lund Bros.' tender for lighting the Upper Marylebone Street school at £294 10s. has been accepted. A lower tender, that of Napier-Kimber, Ltd., at £257, was originally accepted, but has been withdrawn.—The Asylums Committee has given the General Electric Co. the contract for the supply of Osram lamps during the current year.

**Hampstead.**—The tender of the Electrical Engineering & Equipment Co. for high-tension cables has been accepted.

**Maynooth.**—2,300 Royal Ediswan drawn-wire lamps have been ordered for Maynooth College through a Dublin firm.

**Nottingham.**—The tender of Siemens Bros. Dynamo Works has been accepted for Wotan and carbon lamps for the Electricity Department.

**Stretford.**—Bertram Thomas's tender for the lighting of the new school at Trafford Park at £293 has been accepted.

**Walthamstow.**—The U.D.C. Council has accepted the General Electric Co.'s tender for Osram lamps.

## APPOINTMENTS AND PERSONAL NOTES

Mr. H. A. Howie, Deputy Manager and Chief Assistant Engineer at Sheffield, has been appointed Borough Electrical Engineer at Walsall, in place of Mr. A. S. Barnard, whose resignation we recently recorded. The commencing salary is £500 per annum. The following were also on the short list: T. A. Kerr, Engineer and Manager, Trafford Power and Light Supply (1902), Ltd.; F. V. L. Mathias, Borough Electrical Engineer, Warrington; H. H. Perry, Resident Engineer at the Brimsdown Station of the North Metropolitan Electric Power Supply Co.; P. E. Rycroft, Engineer and Manager, Heston and Isleworth U.D.C.; and H. F. J. Thompson, Chief Assistant Electrical Engineer, Battersea.

Pending the appointment of a successor to Mr. J. A. Robertson, Mr. John H. Parker, assistant, is taking charge at Greenock.

The partnership between C. S. Vesey Brown and W. Hall, lately carrying on business as consulting engineers at Milburn House, Newcastle, has been dissolved by mutual consent.

Mr. John B. Sparks has resigned his position under Dr. H. F. Parshall, Consulting Engineer, to take up the position of Chief Electrical Engineer to the Bergwerks u. Hüttenverwaltung G.m.b.H. (Gallus Anlage 2, Frankfurt a. Main), a company owning copper, tungsten, and tin mines in Silesia and Bohemia.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night was £65 15s. to £66 5s. (last week, £65 10s. to £66).

**Agency.**—Nalder Bros. & Thompson, Ltd., inform us that the agreement for the agency which has been held for some years past by Messrs. Frampton & Paine, of 29 Old Queen Street, Westminster, has now expired. Pending new arrangements, all inquiries should be sent direct to Nalder Bros. & Thompson, Ltd., 97A Dalston Lane, London, N.E.

**Bankruptcies, Liquidations, &c.**—W. Walker, late of 2 and 3 Red Lion Court, trading as David Smith & Co., has been adjudicated bankrupt.—The first meeting of creditors of the Globe Association Cable & Telegraph Services, Ltd., will be held at 38 Carey Street, W.C., at 12 noon on May 12th, 1914, followed by that of the contributories at 12.30.



## LOCAL NOTES

**Aberdeen: Extensions.**—The new Oerlikon 3,000-kw. set has satisfactorily passed through the official tests.

**Blackburn: Accounts.**—The income of the Electricity Department during the year was £48,400, and expenditure £24,217. After deducting various charges, the net profit was £5,087. On the other hand, owing to the strike the Gas Committee lost over £10,000 on the year's working compared with a profit of about £10,000 for the previous year.

**Dewsbury: Opening of Extensions.**—The extensions at the Dewsbury Electricity Works, which are now complete, were inspected by members of the Corporation last Thursday. They include a 1,000-kw. Brush turbine driving two dynamos in tandem, Allen condensers, and two B. & W. boilers.

**Coventry: Bonus to Employees.**—There is a surplus for the year of £21,943; £5,000 is to be allocated to relief of rates, a bonus of £375 is to be paid to the employees in the department, and £16,250 is to be added to the reserve fund. Of the last-mentioned amount, £13,250 is to be transferred to capital account, instead of raising a loan for extensions (£2,000 for house services, £2,000 for sub-station equipment, £4,250 for cooling towers, and £5,000 for the laying of distributors from which an immediate revenue is not anticipated).

**East Ham: Relief of Rates.**—£2,000 of the Electricity Department profits has been allocated to relief of rates.

**Ely: Gas Co.'s Application for Provisional Order.**—The Gas Co.'s application for provisional order to supply electricity was the subject of a Board of Trade inquiry last week. The price of gas at Ely is 4s., less 5 per cent. for lighting, and 3s. 4d., less 5 per cent. for power. Only a very small compulsory area is scheduled. Mr. A. H. Dykes gave evidence in favour of the scheme, and referred to the reduction in standing charges which would follow the combination of electricity and gas undertakings. He said there was not sufficient scope for an independent electric light company in Ely. Although the Ely U.D.C. were withholding their consent, they were not represented at the inquiry; but there was strong opposition by the Ely and District Ratepayers' Association.

**Heywood: Bulk Supply from Bury.**—The Board of Trade has granted the Bury Corporation's application for an Order dispensing with the consent of the Lancashire Electric Power Co. for the supply of electricity in bulk to Heywood. A report of the arguments advanced during the hearing of the Board of Trade inquiry was published in our issue for November 6th, 1913, page 623. It will be remembered that one of the reasons advanced by the Lancashire Power Co. against the Board of Trade granting consent was that the offer of the Bury Corporation was lower than the rates at which similar supply was given in Bury itself. The agreement with Bury is for ten years, with the option of extending it for another five years.

**Jersey: St. Heliers.**—The Deliberative Assembly has decided to sanction the electric lighting of the town by a company.

**King's Lynn: Extensions.**—A new 400-kw. reciprocating set, condensing plant, boiler, economiser, and feed-pumps have been put in, and were formally inaugurated on Thursday, last week.

**Kingston: Councillor's Visits to Works.**—At the last meeting of the Council, Mr. Gasson, a member of the Electric Lighting Committee, moved that a member of the Council or Lighting Committee be allowed to visit the electric lighting works at any time, and complained of discourtesy on occasions of his own visits there. Mr. Edgecome, the Borough Electrical Engineer, explained that Mr. Gasson had come frequently at various times without asking for him or for the assistant in charge, and had actually gone on to the switchboard gallery to inspect the log-book. Mr. Edgecome said that he recognised the right of any member of the Corporation to visit the works, but that to do so without notifying him, and to discuss matters with members of the staff, meant undermining his control. The resolution was defeated and Mr. Edgecome's action was endorsed.

**Kingstown: Gas Co.'s Defeat.**—A House of Commons Committee has this week rejected an application by the Dublin & Alliance Gas Consumers' Co. for electric lighting powers in Kingstown, Dalkey, and Blackrock. A rival scheme by the Dublin Southern District Electric Supply Co., promoted by Mr. W. M. Murphy, of the Dublin United Tramways Co., is now under consideration by the Committee. This proposes

only to deal with the district of Kingstown, to which, however, the Council is in opposition, but the feeling of the Committee appears to be that the Company should have the powers, as the Council has not come forward with any definite scheme of its own. A decision has not been reached at the time of our going to press. The Supply Co.'s Order was passed by a House of Commons Committee last session, but was deleted from the Confirmation Bill by the Board of Trade, owing to opposition in the House on the report stage, and the fear of losing the whole of the particular Confirmation Bill, which, of course, contained a number of other orders.

**London: Bermondsey: Black Smoke.**—The Public Health Committee of the Borough Council has written to the Electricity Committee of the Borough Council stating that unless some serious steps are taken to prevent smoke nuisances occurring, it will be compelled to recommend the Council to take proceedings.

**Manchester: Purchase of Trafford Park Co.**—The Manchester Corporation Bill, which includes, among other things, an expenditure of some £200,000, partly in connection with the purchase of the Trafford Power & Light Supply Co., and also in connection with the erection of new power station on the Manchester Ship Canal, is now before a House of Lords Committee. Mr. S. L. Pearce, Chief Electrical Engineer to the Manchester Corporation, spent the best part of Tuesday in the witness chair, and other well-known electrical engineers who are supporting the scheme are Mr. J. F. C. Snell and Mr. C. P. Sparks. There is a good deal of opposition to the proposals, of which further particulars will be given in our next issue.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**R. Waygood & Co.**—An extraordinary general meeting will be held to-morrow to approve a scheme of amalgamation with the Otis Elevator Co. If the amalgamation is sanctioned the name of the new company will be Waygood-Otis, Ltd.

**Chloride Electric Storage Co.**—The directors recommend bringing the ordinary dividend for the year to 10 per cent., plus a bonus of 10 per cent., both free of tax.

**Electrical Apparatus Co.**—A 7 per cent. dividend is being paid on the ordinary shares, £1,000 is placed to reserve, and the formation expenses have been written down by £50 per cent.

**Callender's Cable & Construction Co.**—A 10 per cent. dividend on the ordinary shares for the year, and 5s. per share bonus, has been declared. The directors state in their report that important contracts were entered into last November with the Post Office by which much of the telephone development in the South of England is placed in the Company's hands, and important orders for the cables have been placed. The other cable business is also increasing to a satisfactory extent.

**The Wiremen's Strike in London.**—A Committee meeting of the London Electrical Masters' Association was held on Tuesday, and we are asked to make the following announcement:—The Committee have been making inquiries, and cannot find that any members of the Association are at all inconvenienced by the "so-called strike."—The strike organisers are making every endeavour to broaden the issue of the dispute, so as to affect more employers, but without success. Their latest move was directed against the London District Association of Engineering Employers, who, we understand, have declined to make any concession. We do not think, however, that many of the Electrical Trades Union wiremen are employed by the firms in this Association.

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(Incorporated).

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# ELECTRICAL ENGINEERING

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**THE ELECTRICAL ENGINEER**  
(Established 1884)

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THURSDAY, MAY 14, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 23-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

In a case in the Law Courts on Tuesday, which may have considerable importance as a precedent, judgment was given against an electricity supply undertaking for undue preference in charges for electric power. (Page 266.)

We publish the results of two interesting and important cases in which damages were claimed on account of bad house-wiring. (Page 267.)

HERR RATHENAU, Managing Director of the A.E.G. Co. of Berlin, has stated to an interviewer that his firm has succeeded in producing 50 and 25 c.p. half-watt lamps. (Page 267.)

At a meeting of the newly-formed Association of Supervising Electricians, it was decided that the Association should not take part in trade disputes. (Page 267.)

A DEMONSTRATION of electric vehicles in Birmingham on the occasion of the I.M.E.A. meeting next month is under consideration. (Page 267.)

THE electrical equipment of a granite quarry is described in an illustrated article. (Page 268.)

THE arrangement of negative tramway feeder boosters is discussed in our "Questions and Answers" columns. (Page 269.)

SOME of the Specifications published last week describe improvements in the regulation of cascade motors, duplex telegraphy, automatic telephony and wireless. A patent relating to staff signalling on single line railways expires this week after a life of fourteen years. (Page 270.)

THE London County Council has decided to call in M. Mariage, Directeur Général, Compagnie Générale des Omnibus de Paris, to give advice in connection with the tramways system.—As the result of running tram-cars on Sundays the profits of the Bournemouth Corporation Tramways have increased by £6,000.—An addition to the L.C.C. double trolley line near the Greenwich Observatory has been sanctioned by Parliament.—The proposal of the N.E. Railway to run trolley omnibuses between its Newcastle and Gateshead stations has been rejected by a House of Lords Committee. (Page 271.)

A TOWER as high as the Eiffel tower is to be constructed for a long distance wireless station on the Goldschmidt system, near Brussels. Considerable progress is reported in the Constantinople telephone system. (Page 271.)

A NEW pattern of electric fire, some new glassware, and a large electric sign are illustrated in our Trade Section, which also contains descriptions of various forms of cable junction boxes, an electric cooker with automatic heat regulation, and a sprayer for enamels. (Pages 271 to 274.)

NEW generating plant is required at Stockport, Aylesbury, Woolwich, Leeds, Rangoon, and Walsall; arc lamp carbons are required by the Melbourne City Council; meters at Dublin; electric cranes in Spain; oil break switches in Wellington (N.Z.); and electric lifts at Ashton-under-Lyne. (Page 275.)

THE Manchester Corporation's proposal to purchase the Trafford Power & Light Supply Co., and to extend its area of supply has been rejected in Parliament, but the erection of a new large power station has been sanctioned.—The Bristol electrical contractors are dissatisfied with the present arrangement with the Corporation Electricity Department for wiring consumers' premises.—The Dublin and Alliance Gas Consumers' Co. has met with another defeat in Parliament, this time in connection with the application of the Northumberland clause in the Kingstown electric lighting order.—The Loughborough Gas Committee Chairman has protested against a fixed price system for electric supply as being detrimental to the gas undertaking. (Page 267.)

THE accounts of the B.T.-H. Co. for 1913 show a net profit of £77,044. No dividend is declared, but large sums are placed to depreciation and reserve.—A 6 per cent. dividend is declared by the Electric Construction Co. and by the Craigpark Electric Cable Co.—The Kent Electric Power Co. is able to pay off all arrears of dividend on the 6 per cent. cumulative priority shares. (Page 276.)

Owing to pressure on our space this week, our fortnightly cartoon is postponed.

## ARRANGEMENTS FOR THE WEEK

MONDAY, MAY 18TH.

*Junior Institution of Engineers.*

8 p.m. At Institution of Electrical Engineers, Victoria Embankment. "Static Transformers: Their Design and Application," by F. R. Peters.

THURSDAY, MAY 21ST.

*Illuminating Engineering Society.*

7.30 p.m. Annual General Meeting. "The Nomenclature and Definitions of Photometric Quantities," by A. P. Trotter.

*Institution of Electrical Engineers.*

5 p.m. Annual General Meeting.

SATURDAY, MAY 23RD.

*Association of Mining Electrical Engineers.*

2 p.m. Notts and Derbyshire Branch. Visit to Grassmoor Collieries.

## The London Electrical Engineers.

Headquarters (46 Regent Street, S.W.) open Sat. till noon.  
Rating Exam. for all Cos. from 7 to 10 p.m. every Wednesday.  
Annual course of musketry at Purfleet for all Companies, Saturday, May 16th, and Wednesday, May 20th.  
(To-day) THURSDAY, MAY 14TH, C. Co. FRIDAY, MAY 15TH, D. Co. MONDAY, MAY 18TH, A. Co. TUESDAY, MAY 19TH, B. Co. THURSDAY, MAY 21ST, C. Co. FRIDAY, MAY 22ND, D. Co.

## POWER RATES AND "UNDUE PREFERENCE"

AN important case was decided on Tuesday, with regard to "undue preference" in fixing the charges for electric power supply. Mr. Justice Sargant held that a supply authority has no right to charge different rates for power depending on whether or not the consumer lights his premises by electricity.

Stated briefly, the Judge's construction of the Electric Lighting Act of 1882 is that one consumer may only be charged a higher price than another if it is evident that his supply costs more to the undertaking, from which it follows that to increase or decrease the charges in particular instances merely for the purpose of fighting competition is not allowable. There is reason to believe that the Gas Companies' Protection Association have been supporting the plaintiffs, and that they regard the action as a test case on the question of preferential charging by Electricity Supply Undertakers. Their success may lead to further action in other instances of more important magnitude.

The case in question was an action by the Attorney-General (at the relation of the Long Eaton Gas Co.) against the Long Eaton Urban District Council to restrain the Council from continuing to keep in force a certain tariff of charges for electric supply which, it was alleged, is a breach of Sections 19 and 20 of the Electric Lighting Act of 1882, and constitutes "undue preference." The Council, which works under an Electric Lighting Order granted in 1900, amended its schedules of tariffs as from April 1st, 1910, under which factory lighting was to be charged at 3d. per unit for the first 2,000 units per quarter, with a discount for larger consumptions, whilst for power purposes there was a gradually decreasing scale until at 4,000 units per quarter the charge was 1d. per unit and above 6,000 units ½d. per unit. The supply for power and lighting is given through separate circuits and separate meters. On September 25th, 1911, the Electricity Department issued a circular in which this scale was retained as regards consumers taking current for both power and lighting purposes exclusively, but consumers taking power and no lighting were deprived of the benefit of the ½d. charge above 6,000 units per quarter. This, it was alleged, constitutes an infringement of Sections 19 and 20 of the Electric Lighting Act of 1882, which read as follows:—

19. *Obligation on Undertakers to Supply Electricity.*—Where a supply of electricity is provided in any part of an area for private purposes, then, except in so far as is otherwise provided by the terms of the licence, order, or special Act authorising such supply, every company or person within that part of the area shall, on application, be entitled to a supply on the same terms on which any other company or person in such part of the area is entitled, under similar circumstances, to a corresponding supply.

20. *Charges for Electricity.*—The undertakers shall not, in making any agreements for a supply of electricity, show any undue preference to any local authority, company, or person, but, save as aforesaid, they may make such charges for the supply of electricity as may be agreed upon, not exceeding the limits of price imposed by or in pursuance of the licence, order, or special Act authorising them to supply electricity

Mr. Justice Sargant said that the circular could not be justified unless the combination of power and light cheapened the cost of generation. The Council's case in support of this, however, continued his Lordship, was extremely thin, whilst on the other hand, no technical evidence was called by the Gas Company on this point. Mr. J. F. C. Snell, who gave evidence for the Council, had relied upon the extra business which the tariff would induce in the direction of lighting, but this was inadmissible. The only point in Mr. Snell's evidence which was really relevant was the suggestion that, under the special conditions of Long Eaton, the supply of energy for lighting factories was supplementary to the supply of power, and might improve the load factor. Mr. Snell, however, had had to admit that the lighting load had a worse load factor than the power load. There was, his Lordship concluded, no justification for the differentiation of charges, and the wording of the circular was a strong indication that the reason for issuing it was a desire to oust competition in the supply of lighting. In his opinion there was a breach of Sections 19 and 20 of the Act, and the Gas Co. was entitled to apply for an injunction if necessary. If the Council decided to appeal, an injunction would not be granted pending the appeal. The Council must pay the costs of the action.

The only other case on record of a more or less similar nature to the above was an action successfully brought by the Metropolitan Electric Supply Co., Ltd., against a consumer of the name of Ginder in 1901. Ginder had agreed to take all his supply from the company for five years at 4½d. per unit, but found that the company subsequently supplied another consumer at 4d. per unit, and held that he was no longer bound by the agreement. The more-favoured consumer had a good day-load, however. The interpretation by Justice Buckley of the phrase "similar circumstances" in the above Clause 19 was as follows (we quote from Shirees Will's "Law of Electric Lighting") :—

The phrase "similar circumstances" in Section 19 embraced amount of energy consumed, the expense of supplying it and getting payment, uniformity of demand and the time when the energy was required, and unless all the circumstances were similar, agreements might lawfully be made for different terms and at different rates.

The above definition will be useful as a guide to supply station engineers and managers as to the extent to which they may vary their charges to different consumers.

**The Organisation of Empire Trade.**—This is the title of an excellent article by Mr. Hugo Hirst, Chairman of the General Electric Co., which appears in the first number of the *Britannic Review*, just issued. Mr. Hirst urges that practical steps should be taken to consolidate and co-ordinate the rules governing the great trading communities within the British Empire. The appointment of Trade Commissioners he recognises had been a step in the right direction, but this had been limited to self-governing dominions, and nothing has been done in connection with the Crown Colonies. As instances of the present state of affairs, Mr. Hirst mentions that 32 Crown Colonies and Native States have separate patent laws or ordinances, and that Australia, New Zealand, Canada, and Newfoundland have all different patent laws. It costs a British inventor £500 to £600 to get a patent in force throughout the Empire, while a patent may be made valid throughout the United States for about £20. The establishment of a common basis for trade statistics, a uniform classification of dutiable goods, and reform of the methods of taxing commercial travellers are among the suggestions made in the article.

**The Toronto Hydro-Electric System.**—The third annual report of the Toronto Electric Commissioner, under whose control is the distribution system in Toronto, which is supplied from Niagara by the Hydro-Electric Power Commission of Ontario, refers to the appointment of Mr. H. H. Couzens last year as General Manager, under a three years' agreement, and mentions that the former Acting General Manager and several of his subordinates had been peremptorily dismissed, and this was followed by a strike, which was afterwards settled by arbitration. Notwithstanding these difficulties, there has been a net profit of \$34,575, after paying interest, depreciation, sinking fund, &c. It is pointed out that if the undertaking were a company with share capital, the surplus would be equivalent to a 7½ per cent. dividend. During the year the peak load has increased by 31 per cent., the consumers, as measured by number of meters, by 80 per cent., and the street lamps by 15 per cent. The cost of current has been reduced considerably, and the load factor has been raised from 59.5 to 70.4 per cent. It has been decided to install a steam reserve plant at a cost of \$1,000,000.

## TWO LAWSUITS ON WIRING

JUDGMENT was given on Friday in an interesting case, which had lasted three days, on the question of a claim for breach of contract in connection with the wiring of Mrs. Irene Osgood's house, Guilsborough Hall, Northampton. In February, 1904, Mr. Leo Sunderland's offer to wire the house was accepted, and it was arranged that concealed work should either be in American whitewood casing or in brazed steel tubing. The work was completed a few months later and duly paid for, and down to 1909 Mr. Sunderland, by arrangement with his customer, sent down to inspect it every six months. In December, 1909, a hot-water installation was put in the house, and in 1912 some structural alterations were made inside the house, as a result of which some of the wiring was exposed. This revealed, it was said, that some of the wiring was not protected by tubing or casing, and it was alleged that a subsequent examination had revealed that under the floors the tubing or casing only covered the wires for a short distance under the screwed boards, where it would be liable to be uncovered and seen, and that elsewhere the wire was unprotected. This, it was claimed, amounted to fraudulent misrepresentation as to the nature of the work done, and that therefore, although the period between the acceptance of the installation and the present claim exceeded six years, the Statute of Limitations would not apply. It was not suggested that Mr. Sunderland was personally aware of the bad work when it was put in, but it was contended that he should nevertheless be held responsible for it. It was acknowledged on both sides that bad tests had been obtained on the installation due to dampness, and eventually the whole installation was rewired by another firm. For Mr. Sunderland it was contended that the wiring had been pulled about during the putting down of the hot-water installation, but Mr. Justice Bailhache decided "with much reluctance" that the work had been badly done originally, and that steps had been taken to conceal it. After reviewing the case, in connection with the application of the Statute of Limitations, however, he gave judgment in favour of Mr. Sunderland, with costs, except as to issues of facts.

Although relating to house-wiring, this case differs from that of the War Office against Messrs. Kirkland & Capper and Mr. Woodd, judgment on which has been given since the publication of our report of the case in our issue of April 23rd. It will be remembered that the War Office claimed damages from the architect, Mr. Woodd, and the consulting electrical engineers, Kirkland & Capper, for negligence in permitting lead-covered wire to be placed under plaster, without other protection, in the wiring of the Royal Army Medical College and Laboratories at Millbank. In giving judgment, Mr. Justice A. T. Lawrence held the architect, as well as the consulting engineers, responsible, for he said there was an entire want of co-ordination between them. If it had been thought that the "Frazzi" blocks used in the building could not be covered, it would have been easy to have specified a thicker coat of plaster to take the tubing; moreover, he said, it had been demonstrated in Court that the blocks could have been chased without difficulty before erection. The installation was completed in May, 1907, and the free maintenance period expired in May, 1908. Even during this period, however, there had been trouble with the installation, and finally in July, 1909, twenty-three out of eighty-three circuits in the College were defective and the number had risen to thirty by January, 1910, when the defects were located to the actual wiring, and not in fittings or switches. The bare lead-covered wires under plaster, he held, did not comply with the specification that they should be accessible. Further, he was satisfied that the supervision of the work had been inefficient; the bonding at the connector boxes was bad, the wires showed signs of having been bent too sharply, wires were run against edges of brickwork without any protection, flexes were knotted at the ceiling roses, and there was no attempt to provide any protection against nails or any plan to show where the wires were. He did not accept the contention that the faults had been caused by the War Office employees putting in too heavy fuses. Finally, the judge commented unfavourably on the fact that the fee of 5 per cent. of the value of the electrical work which was to be paid by the War Office to Messrs. Kirkland & Capper was shared with Mr. Woodd in the proportion of 4 per cent. to Kirkland & Capper and 1 per cent. to Woodd, a fact which was unknown to the War Office or its advisors until after the present action had been brought.

In the College, as has already been said, thirty out of

eighty-three circuits were defective; in the laboratories, seven out of seventy-four. The damages awarded against the defendants by the Judge are limited to the cost of reinstating these circuits in an approved method, and if the cost of these is not agreed between the parties, the matter is to be referred to an official referee for decision. Judgment was given for the plaintiff for the amount so agreed against both sets of defendants, and with costs.

## 25 C.P. HALF-WATT LAMPS!

THE *Berliner Tageblatt* last week published an "interview" with Geheimrat Emil Rathenau, Managing Director of the A.E.G. Co., of Berlin, in which he stated definitely that his Company had succeeded in producing not only 200 c.p. lamps, but also lamps of 50 and 25 c.p. consuming only half a watt per c.p.

In the course of the interview, Herr Rathenau referred also to the growing tendency for amalgamation and centralisation of power supply. Herr Rathenau has always been a strong advocate and a strenuous fighter for private enterprise; it is significant that he expressed the opinion that the smaller undertakings will not be able any longer to withstand the strong movement for amalgamation, particularly in view of the coming reduction of the lighting load consequent upon the introduction of the new lamp. They will, he said, find it necessary to amalgamate and take current either from large central stations owned jointly by the small undertakings, or from one of the large State power stations now under construction mainly for railway supply. One such station has already contracted to supply 30 million kw.-hours yearly to such local undertakings. On the other hand, a State monopolisation of electricity supply for the whole of Germany, Herr Rathenau continued, is hardly probable, particularly as the separate States of Bavaria and Baden have already commenced to establish electricity supply networks of their own in connection with the utilisation of the State water-power rights, but such monopoly is quite conceivable for the State of Prussia. Such monopolisation would enormously facilitate and cheapen the long-distance transmission of electrical energy, especially if coupled with compulsory wayleaves for overhead lines and cable routes.

## THE ASSOCIATION OF SUPERVISING ELECTRICIANS

A GENERAL meeting of this Association was held at St. Bride's Institute, E.C., last Thursday. It was decided that the headquarters should be at St. Bride's Institute, and that the membership should be confined to foremen, supervising engineers, and managers in the electrical contracting trades. It is intended to admit only men of undoubted qualifications. The subscription is 10s. per annum, payable 2s. 6d. quarterly in advance, with an entrance fee of 5s. for London members and 5s. for country members. Honorary members are eligible at a subscription of not less than one guinea per annum. It was resolved that a Benevolent Fund should be formed, and honorary members' subscriptions and all special donations should be placed to a reserve fund available for the benefit of members requiring assistance. It was also decided to keep a register of vacant situations, and to insert advertisements in trade journals for members out of employment. A resolution was unanimously passed that the Association should not take part in any trade disputes. Particulars of the Association may be obtained from the Honorary Secretary, 14 Pulborough Road, Southfields, S.W. The objects of the Association are:—To assist members in obtaining information of situations; to form a technical library; to form a Benevolent Fund; to hold lectures and to arrange visits to works; to foster the apprentice system; to extend the attendance of electrical workers to evening schools; to arrange reading of Papers on electrical subjects, and social gatherings.

**Electric Vehicles.**—Mr. E. W. Curtis, jun., Vice-President of the General Vehicle Co., of Long Island, U.S.A., has been elected a member of the Electric Vehicle Committee during his stay in England. Mr. J. W. Beauchamp (West-Ham Corporation Electric Supply) and Mr. K. Bowen (director of the Cedex Electric Traction Co., Ltd.), have also been invited to become members. A demonstration of electric vehicles in Birmingham on the occasion of the Incorporated Municipal Electrical Association's Convention in June is under consideration. With regard to the standard charging plug, a design for the earthing contact has been provisionally decided on; and as to maximum carrying capacity, heating tests are to be made by the Acting Hon. Secretary of the Technical Sub Committee, Mr. J. Christie. This Sub-Committee has been considering the possibility of standardising battery trays, but there appear to be difficulties in the way, and they decided to obtain the views of battery makers as to the feasibility of standardising the height and width of lead battery plates as a commencement.



## ELECTRICITY AT A GRANITE QUARRY

**I**N stone-working plants the machines are generally scattered over a considerable area. The conditions are in most cases unfavourable to the efficient operation of steam engines, and the use of electricity possesses special advantages in its low transmission losses, high efficiency at all loads, and high overload capacity of the motors.

When the plant is of very large size, or a central station supply is not available, it may sometimes be advisable to instal a steam or oil-driven generator in a central position

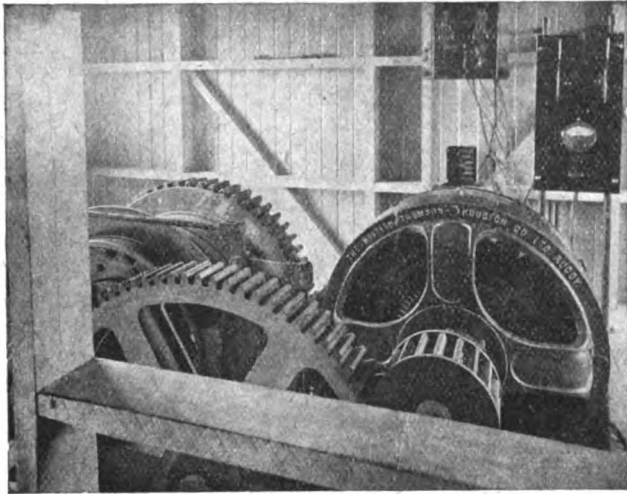


FIG. 1.—100-H.P. MOTOR DRIVING HAULAGE GEAR.

on the premises, but in the majority of cases it will be found more economical to purchase power from a supply station.

A good example of an up-to-date stone-working plant is the Griff Granite Quarry, near Nuneaton, a description of the electrical equipment of which has been sent us by the British Thomson-Houston Co., Ltd. The stone from this quarry is used chiefly for setts, road metalling, concrete making, &c. The granite is freed by blasting; air-driven rock drills are employed, fed from an electric motor-driven compressor situated in a central position near the crushing mill, through a piping system serving convenient points in the workings. The large masses of granite detached by the blasting operations are first broken up by hand to roughly the size required

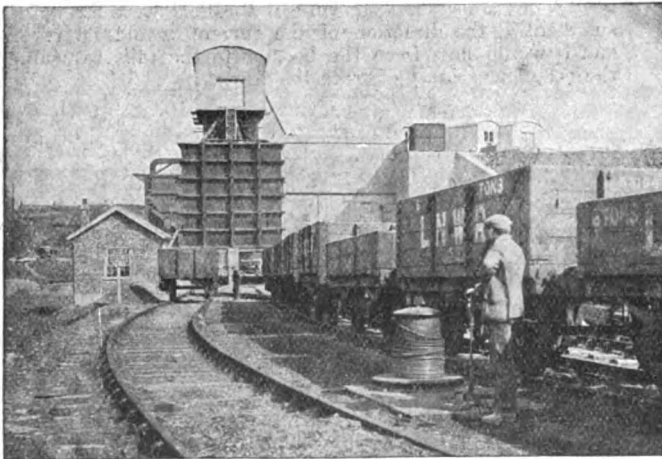


FIG. 2.—14-H.P. ELECTRIC CAPSTAN WITH CRUSHING MILL IN BACKGROUND.

for setts, and the small blocks thus obtained are then transferred either to the crushing mill, where they are broken up to a size suitable for road metal, &c., or to sheds, where they are cut to size for setts. The rough material is conveyed from the workings to the mill, &c., in trucks which are hauled by a 100-h.p. B.T.-H. electric motor situated in a haulage house at the highest point of the property, the empty trucks being returned to the workings by gravity. The finished product is despatched either by canal or by rail, and for handling the railway trucks in the quarry yard two electric capstans are installed. These have the ropes permanently attached to the drum, and are operated by B.T.-H. 14-B.H.P.

electric motors, which, with their controllers, are placed below the ground under the capstan head. The controller is operated by a lever which also operates a clutch, by means of which the drum can be disconnected from the motor when the trucks are running down the incline.

A considerable amount of water has to be dealt with, owing to underground springs. For the removal of this, two pumping sets have been installed, and an additional set is ready to be erected when it becomes necessary. Each of these sets consists of a Pulsometer Engineering Co.'s centrifugal pump direct-coupled to a B.T.-H. type motor rated at 9 to 29 h.p., with a speed variation of 1,150 to 1,900 r.p.m. One of these sets, situated in the northwest part of the workings, is required to operate for three to six hours per day, the length of time varying with the state of the weather. This is due to the fact that in wet weather a considerable quantity of surface water has to be dealt with, in addition to the spring water, which is fairly constant in quantity. This set can be arranged to deliver water to a tank situated alongside the

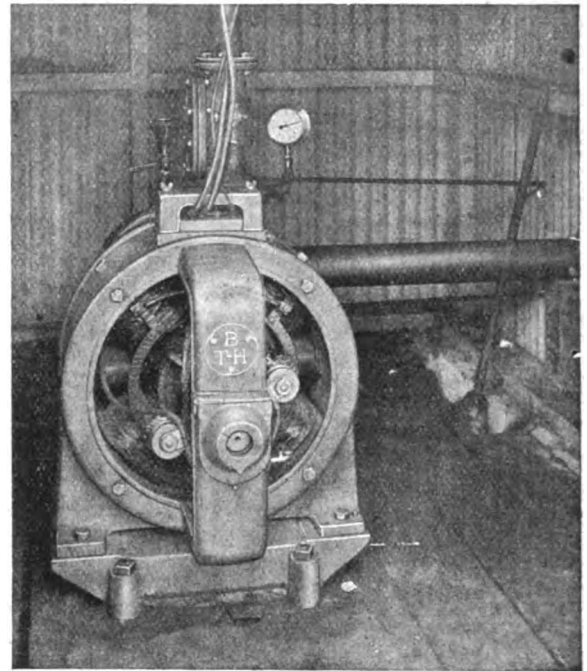


FIG. 3.—9 TO 29-H.P. MOTOR RUNNING AT 1,150 TO 1,900 R.P.M. DRIVING CENTRIFUGAL PUMP.

haulage house, or alternatively to discharge it into the canal, the heads against which the pump is working being 120 ft. and 60 ft. respectively in the two cases. The second set is at present required to deal with surface water only, as no springs have yet been struck in the part of the quarry where it is installed. All the motors used in this quarry are operated from a 420-volt D.C. supply obtained from the Nuneaton Electric Supply Co., the power being brought to the quarry by an overhead transmission line about two miles in length.

The installation here described is used entirely for the rougher part of stone-working, but, as an example of the use of electricity for stone cutting, as distinct from quarrying, we may mention the works of Messrs. Tomes, Good & Co., Ltd., of Fulham, where B.T.-H. two-phase slip-ring-type induction motors are used to drive sawing frames for cutting rough blocks of marble into slabs of suitable sizes for building purposes, monumental works, &c.

**Frequency Changing by Static Transformers.**—After the reading of his Paper at the meeting of the Birmingham Local Section of the Institution of Electrical Engineers on April 29th (see *ELECTRICAL ENGINEERING*, April 30th, page 238), Mr. A. M. Taylor showed experimentally that the apparatus was reversible and obtained a 25-cycle current from a 75-cycle supply. He suggested that this arrangement might be useful for the supply of power for electric furnaces, and if the power factor difficulty could be satisfactorily overcome for electric railways, or any application where close voltage regulation was not necessary. He also went into the question of power factor of the ordinary apparatus, which is very low, being only of the order of 0.2, and argued at some length that in many cases it would pay to instal phase advancers in conjunction with the system.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,391.

A .20-h.p. shunt-wound motor running at 510 r.p.m. has been put in to drive the main shafting of a machine shop at 120 r.p.m. The rated full load current is 75.5 amperes at 220 watts. When the planing machine is in action this current is not exceeded on the cutting stroke, but rises to 120 amperes on the return stroke. Will some reader suggest a remedy? Would it be practicable to alter the gear ratio between the motor and shafting, and to increase the speed of the motor by weakening its field?—"ELECTRIC MOTOR DRIVE."

(Replies must be received not later than first post, Thursday, May 21st.)

### ANSWERS TO No. 1,389.

In a tramway station using three negative boosters connected at three different points of a common continuous rail return, and with no other connection to the rail, the station being some 2,000 yards from the tram track, the earth plates are fixed at the station; does this violate the B.O.T. Rules? If one of the boosters was connected with the wrong polarity, instead of sucking, what would happen? If one of the boosters broke down would it be advisable to cut it out and short across, bearing in mind the long length of return cable, over 2,000 yards,

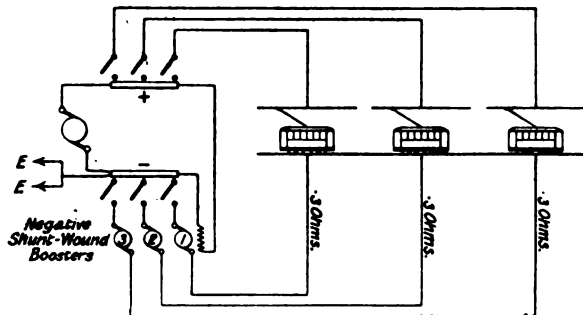


Fig. 1.

and that the negative bar is earthed at the station? Is there any necessity to fit any protective device to protect the booster in the event of the circuit-breaker on the motor circuit acting and cutting out the motor, bearing in mind that the boosters are plain shunt wound and separately excited off the traction bus-bars? On what basis would you regulate the pressures of the three boosters? The ohmic resistance of the negative returns are all about equal, and are connected to one continuous rail.—"ELECTROLYSIS."

The first award (10s.) is given to "E. B. P.," who writes as follows:—

Section No. 5 (e) of the B.O.T. regulations for tramways and light railways states that:—

"When the generator is at a considerable distance from the tramway, the uninsulated return" (i.e., the rails) "shall be connected to the negative terminal of the generator by means of one or more insulated return conductors, and the generator shall have no other connection with earth; and in such case the end of each insulated return connected with the uninsulated return shall be connected also through a current indicator to two earth-plate connections," &c.

As in this case the generating station is over 2,000 yds.

from the tramway, it would seem that this regulation is not complied with by earthing the negative bus-bar at the station, and that the only connection to earth should be at the rail end of the negative feeders, where, also, the necessary earth plates, current indicators, &c., should be connected, the station ends of the feeders and the negative bus-bars being insulated. But apart from this, the present arrangement is not good. Reference to Fig. 1 will show that there is a circuit from the boosters, to the negative bus-bar and earth-plates, through the earth to the rails, and so back along the negative feeders to the boosters, and as the latter are separately excited it will be very difficult to prevent them sending a current on their own account through this circuit, in addition to whatever current may be returning from the rails; this being a waste of energy, and involving serious danger to water-pipes, &c., from electrolysis. If the system were only earthed at the rail, this could not occur. Moreover, if they were constructed as series machines instead of shunt, and the field excited by the current flowing in the corresponding positive feeder, the boost would be approximately proportional to the load, and there would be very little current in the local earth circuit, even if both ends of the feeders were earthed. It may be mentioned that this series arrangement is the more usual.

It is a little difficult to see what is the object of the arrangement of boosters in the present example. The three negative feeders appear to be all of about the same length, whereas negative boosters are usually installed to keep down the rail drop by inducing the current from a distant part of the tramway to return by a long negative feeder, instead of all returning by the rails to a shorter one. Consequently, no basis can be suggested for regulation of the booster voltage at all, and, for all the use they are, they might as well be scrapped. But if there is any difficulty in getting the current to distribute itself properly between the three feeders, either due to large differences in length or any other cause, then the boosters could be used to correct the same. In that case they ought to be regulated so as to ensure that the current returning by each negative feeder shall be about the same as that in the corresponding positives. As previously mentioned, series-wound machines would ensure this automatically.

If one of the boosters were connected up with the wrong polarity, if its field were weak, the current returning *via* that feeder would be reduced, while if the field were strengthened sufficiently, the direction of the current would be reversed, and it would flow from the booster to the rail, returning by the other negative feeders to the negative bus-bar, and thence back to the faulty booster. The current leaking from the rail to the station earth plates would also be increased.

In case of a booster breaking down it would be well to cut it out and short across in order to reduce the resistance in that circuit as much as possible.

If the motor circuit-breaker were to operate, the booster would be likely to race away in the reverse direction, consequently it ought to be provided with an automatic switch to cut it out, and preferably, short-circuit it. This switch could be operated by the motor circuit-breaker, or, better, by a centrifugal device. As the rotation of the machine would be reversed, an alternative method of protection would be a ratchet clutch on the shaft to prevent the reversal occurring.

No second award has been made.

### ANSWER TO CORRESPONDENT

FLASH.—We do not think that the breakage of the filament can be attributed to the short circuit in the lamp holder.

**The Batti-Wallahs Society.**—The following is a list of provisional dates for the coming season's programme: Up-river trip, June 27th; barge trip, July 31st to August 10th; ship visit, during September; smoking concert, October 2nd, 1914, and January 8th, 1915; informal evenings, October 21st, November 18th, December 16th, 1914, and February 3rd, March 31st, and April 21st, 1915. Annual dinner, February 27th, 1915, and annual general meeting, March 8th, 1915. Secretaries of other Societies who may have settled on any dates which clash with the above are invited to communicate with the Hon. Secretary, Mr. F. Pooley, 25 Victoria Street, S.W. We hear that for the up-river trip on June 27th the *Royal Thames* has been chartered, which will accommodate 150 Batti-Wallahs, ladies, and friends.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published May 7th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

8,968/13. **Arc Lamps.** T. F. BRYEN, E. A. GOLDING, and H. J. PEARCE. This invention applies to lamps used for projection apparatus, where it is desirable to keep the arc in the same horizontal plane whilst the carbons are being consumed. A flame arc is used, and the carbons are inclined at equal angles at each side of the optical axis of the apparatus and are fed in the usual manner, the feed mechanism being adapted to suit. One figure.

9,260/13. **Cascade Motors.** L. J. HUNT and SANDYCROFT, LTD. The rotor windings are connected to six slip-rings instead of to three as at present. By inserting appropriate resistances between the various slip rings, local currents in the windings are obviated. The power factor is thus kept up, at speeds much below the normal. Five figures.

9,261/13. **Starting of Synchronous Motors.** L. J. HUNT and SANDYCROFT, LTD. The rotor windings are suitably connected to the slip-rings, and extra coils are provided in the stator windings, for direct current excitation. An exciter is direct-coupled to the shaft, and supplies current to these extra coils. In starting, resistances are inserted between the slip rings, and the machine starts as an ordinary induction motor, and will tend to speed up beyond cascade synchronism. The D.C. field prevents this, and when this field is strengthened, and the slip-rings open-circuited, the machine runs as a synchronous motor at cascade speed. Four figures.

9,893/13. **Electrically-operated Rock Drills.** T. F. WALL. Two solenoids are used, one for the forward stroke and one for the return stroke. They are connected in series and are excited alternately, the alternate connections being controlled by the movements of the plungers. Either A.C. or D.C. excitation may be used. An automatic rotary motion is imparted to the drill during its working stroke. Three figures.

14,487/13. **Automatic Telephone Systems.** SIEMENS & HALSKE AKT.-GES. An improved system of inter-connections whereby in the case of subscribers belonging to the same exchange, the junction lines leading to the main exchange are only used during the connecting up of the calling and called lines. Hence fewer junction lines between exchanges are needed. One figure.

18,663/13. **H.T. Transformers with High Reactance.** B.T.-H. (G.E. Co., U.S.A.). In place of the laminated iron strips before used, a flat strip is wound in a spiral, directly over the secondary winding of the transformer. This device is found to give a straight line reactance from no load to full load, whilst at the same time, great mechanical rigidity is obtained. Two figures.

24,347/13. **Preparation of Aluminium Nitride.** SOC. GÉNÉRALE DES NITRURES. A mixture of alumina and carbon is heated in an atmosphere of nitrogen in an electric furnace. The materials themselves serve as the heating resistances. The furnace is divided into a number of sections, and electrodes, in the form of metal joint rings, are situated between the sections. The furnace revolves during operation. The heating effect in each section depends upon the length of the latter and the voltage between the electrodes at each end, and can be varied in different parts of the furnace, as required. Two figures.

27,175/13. **Radio-telegraph Stations.** MELLERSH JACKSON (Signal Ges.). Method of improved wireless communication with airships. In place of stations using ordinary long waves, special short-wave land stations must be used, giving waves of the same order as the apparatus carried by airships. The antenna structure must be raised above the ground a distance which is a multiple of its own height. The land station may be either on the ground level or supported on a platform. Two figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** WEISS, 24,243/13.

**Distributing Systems, Cables and Wires, &c.:** HAWORTH [Transmission gear control] 9,996/13; SIEMENS BROS. (Siemens Schuckertwerke [Flexible connections] 29,003/13).

**Dynamos, Motors, and Transformers:** SANCHEZ and BARADAT [Generator for automobiles] 22,228/13; SIEMENS BROS. [Ventilation of electric machinery] 29,203/13; SIEMENS SCHUCKERTWERKE Ges. [Cooling arrangements for rotors] 5,828/14.

**Incandescent Lamps:** VOIGTLANDER [Manufacture of tungsten] 6,911/13.

**Instruments and Meters:** XENAKY and GILMAN [Generator efficiency indicator] 17,066/13; B.T.-H. (G.E. Co., U.S.A.) [Electrolytic meters] 2,850/14.

**Storage Batteries:** DE MELLO [Batteries] 24,471/13.

**Switchgear, Fuses and Fittings:** PRIM and ROPER [Thermostats for electric circuits] 9,140/13; B.T.-H. (G.E. Co., U.S.A.) [Switches] 9,384/13; SOC. D'ELECTRICITÉ MORS. [Railway switches] 22,127/13; COLAS and SOC. D'ELECTRICITÉ "NILMELLOR" [Electrical contacts] 23,754/13.

**Telephony and Telegraphy:** HULFISH [Telephony] 4,071/13; FURNIVAL [Automatic telephones] 9,205/13; AUTOMATIC TELEPHONE MFG. Co. (Automatic Electric Co.) [Telephone systems] 9,593/13; JUDD, DAVIES, and EASTERN TELEGRAPH Co. [Telegraphy] 9,768/13; SMITH [Telephone mouthpiece cover] 18,902/13; SORENSEN [Brush for high-frequency apparatus] 22,176/13; GRAHAM [Telephone systems] 26,287/13; VOIGTSBERGER and WEST [Transcribing apparatus for telegraphs] 83/14; HASTINGS [Impulse transmitter for telephone systems] 4,082/14.

**Traction:** PARTINGTON [Locomotive signalling] 22,386/13; PRIOR [Lighting for road vehicles] 24,898/13.

**Miscellaneous:** IRVING and O'DONNELL [Electrically-controlled valves] 11,623/13; SCOTT [Engine-starters] 14,742/13; SIEMENS BROS. [Paper-feeding device] 17,125/13; FR. HESSER MASCHINEN-FABRIK AKT.-GES. [Releasing device for packing-machines] 3,004/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires:** CONCORDIA ELECTRIZITÄS Ges. [Wiring installations] 8,982/14.

**Dynamos, Motors and Transformers:** SIEMENS SCHUCKERTWERKE Ges. [Synchronizing rotary and cascade converters] 7,684/14, 9,225/14; SOC. ANON. DES AUTOMOBILES ET CYCLES PUGOT [Brushes] 9,231/14; YARDLEY [Dynamo-electric machine] 9,280/14.

**Electrometallurgy and Electrochemistry:** Ges. FÜR ELECTRO OSMOSE [Diaphragm for electro-chemical purposes] 9,265/14.

**Ignition:** KELLER-DORIAN [Magneto] 8,931/14; TISMER [Spark-plugs] 9,444/14.

**Incandescent Lamps:** KREMENEZKY [Filament supports] 19,838/13; SCHAEFER [Holders] 8,806/14.

**Instruments and Meters:** BECKMANN [Eddy current speed indicators] 3,021/14.

**Switchgear, Fuses and Fittings:** DIRKS [Control of lift switches] 9,289/14.

**Telegraphy and Telephony:** SIEMENS & HALSKE AKT.-GES. [Automatic telephone systems] 459/14.

**Miscellaneous:** KRAMER [Drive for talking machines] 7,566/14.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

8,998 of May 15th, 1900. **Railway Signalling.** E. W. SMITH. A system of staff signalling for use on single-line railways. The staffs are contained in holders at each end of the section, and it is rendered impossible for the engine-driver to remove a staff from its holder until the correct signal has been sent by the operator at the other end. This is accomplished by an arrangement of interlocked levers, controlled by an electro-magnet. When the magnet coils are energised, the armature is attracted and unlocks the levers, thereby allowing one staff to be removed from the holder. A bell, preferably of the polarised type, is used for signalling, and the current for operating both the magnet coils and bell is obtained from a magneto generator which gives both direct and alternating current. Seven figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** M. FORTNY [Arc lamp with motor-driven feed mechanism] 1,410/06; H. E. MARL [Arc lamps with inclined, self-cleaning electrodes] 1,596/08; P. HANISCHE [Circuit breaking device for arc lamps] 1,813/09.

**Dynamos, Motors, and Transformers:** O. DE FARIA [Electrolytic rectifier] 1,456/07.

**Storage Batteries:** J. B. MILLS (T. A. Edison) [Machine for forming accumulator plates] 1,929/06.

**Telephony and Telegraphy:** A. J. BOULT (International Telechronometer Co.) [Telephone system with automatic call recorder] 1,548/09.

**Traction:** C. J. SPENCER [Railway signalling. Signal lamp circuits closed and opened by the train entering and leaving each section] 1,695/06.

**Miscellaneous:** J. S. STEVENS and H. MAJOR [Lift control. A device for cutting out resistance from motor circuit when lift starts] 1,401/01; OTIS ELEVATOR Co. [Pneumatic control of lift motors] 1,548/02; WATTS [Advertising device] 1,765/09.

## ELECTRIC TRACTION NOTES

Monsieur A. Mariage, General Manager of the Compagnie Générale des Omnibus de Paris, has been appointed to assist the Council with regard to schemes which have been prepared for the consolidation and linking-up of the Council's tramways system at an inclusive fee of £250, plus £75 for an assistant to act as interpreter.

The Bristol Tramways Committee, in view of the decision of the House of Lords Committee, given in our last issue, has decided to recommend the Council to purchase the whole of the Bristol Tramways & Carriage Co.'s undertaking.

The Hastings & District Electric Tramways Co. has now six Tilling-Stevens petrol-electric tramcars on the old route upon which the Dolter surface-contact system was used, and a further eleven are on order.

The financial result of the past year's working on the Bournemouth Corporation Electric Tramways are extremely interesting, owing to the influence upon them of the running of the tramcars on Sundays. This policy had been defeated in the Council for many years in succession, but last year (the first in which the cars had been run on Sundays) shows that £6,000 of the profit is due to this fact. There was a net profit of £13,167 for the year, as against £10,320 in the previous twelve months.

The proposal of the North Eastern Railway Co. to run trolley-omnibuses between its Newcastle and Gateshead stations has been rejected by a House of Lords Committee. The scheme was strongly opposed by the Newcastle-on-Tyne Corporation, who offered to promote a scheme to carry trams across the Gateshead Bridge next session. The scheme, however, was rejected without any liability on the Corporation to carry out its suggestion.

The Potteries Electric Traction Co. placed a suggestion before the Stoke-on-Trent Borough Council that the right of the Corporation to purchase the Company's undertaking should be synchronised so that one date should apply for the purchase of the whole undertaking, and that this should be December 31st, 1940. In return for this extension the Company offers to pay certain wayleaves to the Corporation, and to carry out a number of improvements estimated to cost £35,000. These terms are practically agreed, and the Tramways Committee recommends their acceptance.

A House of Commons Committee has sanctioned the construction by the L.C.C. of 1½ miles tramway along Eltham Road, which is to be constructed on the double-trolley system. The L.C.C. has experienced no trouble with the existing double-trolley line which was constructed to prevent interference with Greenwich Observatory.

TELEPHONY AND TELEGRAPHY  
(INCLUDING WIRELESS)

A report issued by the Constantinople Telephone Co. to December 31st states that the three principal exchanges at Stamboul, Pera, and Kadikuey are now in operation, and extra plant has been necessitated by the developments at the Pera exchange. Orders for 4,605 telephone stations are in hand, and submarine cables have been laid between Golden Horn and Bosphorus. The capital expenditure at December 31st amounted to £302,446.

Gratifying results are reported from a new automatic exchange installed by the United River Plate Telephone Co. at Cordoba. A second exchange of the same type, viz., the Strowger, is on order for Rosario.

An international congress of telegraph and telephone engineers is to be held in Berne in September. Among the subjects to be discussed are the protection of telephone and telegraph lines from electric power currents, long-distance land and submarine telegraphy, and automatic telephone exchange working.

In the course of a recent interview, Prof. E. W. Marchant (Liverpool), who has recently returned from a wireless conference in Brussels, announced that Dr. Goldschmidt intends to erect shortly at his wireless laboratory at Laeken an aerial 333 metres in height, or as high as the Eiffel Tower. The present tower is 70 metres in height. The wires will cover an area more than a quarter of a mile across. The Belgian Government hope to get into communication with the Congo from the station.

The report of the Great Northern Telegraph Co. (Denmark) records slightly lower traffic and slightly higher expenses than last year, although the usual dividend of 20 per cent. for the year is possible. An increase in cable interruptions in the Far East is attributed to the more common use of trawlers in Chinese and Japanese waters. The West Coast of America Telegraph Co. also reports trouble with interruption. Their various sections were interrupted for an aggregate of 114 days, principally owing to earthquakes.

At the meeting of the Anglo-American Telegraph Co. last week it was stated that a decision has been come to to keep about 335 miles of new cable on hand permanently for general purposes. The Company is about to purchase this quantity at a cost of £50,000.

On the 8th inst. landline communication with Siam *via* Moulmein was normal again.—There has been some derangement of lines in the British Isles recently, but repairs have been effected.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 275. —

## CATALOGUES, PAMPHLETS, &amp;c., RECEIVED

**CUTTING-OFF MACHINES.**—A rotary cutting-off machine for bars, tubes, &c., is described in a revised edition of a catalogue from Charles Taylor, Ltd. (Bartholomew Street, Birmingham). These machines were first introduced in October, 1912, and 55 have been sold since. They are solidly made, and rapid in action. The catalogue deals with the 3-in. size of machine, but machines for work up to 1½ and 8 in. respectively will shortly be introduced.

**GOVERNORS.**—A leaflet from Percy Pitman (3 Willcott Road, Acton, W.) deals with a new pattern of hydraulic governor for controlling water turbines, Pelton wheels, &c. The leading features of these were described in a Paper by Mr. Pitman recently published in the proceedings of the Institution of Mechanical Engineers.

**ALLOYS.**—Miralite, Ltd. (52 Gracechurch Street, E.C.), have sent us a booklet describing the features of a new untarnishable uncorrodible aluminium alloy, which can be cast, rolled, spun or drawn, and has a tensile strength from 12-14 tons per square inch.

**ENGINEERING PLANT.**—A booklet from E. G. Appleby & Co. (12 The Broadway, Westminster, S.W.) calls attention to some of their specialities, including gas-producer plant, lift magnets, cranes, and transporters, &c.

**DRY CELLS.**—A leaflet from The Edison & Swan United Electric Light Co., Ltd., gives particulars of a new form of the "E.C.C." dry cell for which the company hold the sole selling rights for the United Kingdom.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**CABLES AND WIRES.**—Prices of 600 megohm grade I. R. cables, bell wires and flexibles are contained in a special nett list from Ralph H. Haylock & Son, 63 Queen Victoria Street, E.C.

**EQUIPOISE TELEPHONE ARM.**—We have received from Messrs. the Sterling Telephone & Electric Co. (210-212 Tottenham Court Road, London, W.) a pamphlet describing the "Equipoise" telephone arm, which can be fixed to the desk or wall and swivelled into any position most convenient when required.



## "MAGNET" ELECTRIC FIRES

THE Heating Department of the General Electric Co., Ltd., has recently evolved two types of heaters known as "Magnet" electric fires, in which the element is run at a most pleasing glowing temperature. These electric fires are made in numerous designs. In one form, the Panel type, a special non-oxidising high-resistance wire is wound in a helix and arranged in specially-designed fire-resisting insulators. These are curved from top to bottom, as may be seen from Fig. 1, and the terminals of each section are arranged at the bottom corners. The fire-resisting insulator is grooved from top to bottom, and the wire helix lies in these grooves, starting from its point of entry up to the top, through a hole for anchoring purposes, down the next groove through a similar hole at the bottom, and up the next groove through another hole, and down to the other terminal. The wire helix is further anchored by specially-designed pegs passing through holes in the insulator arranged for the purpose. Thus, the spacing of the individual turns of the helix is maintained constant. Each element is designed for 500 watts, and the standard fires are arranged for 1,500 or 2,000 watts. Two switches are provided to give different degrees of heat. These



FIG. 1.—PANEL TYPE.

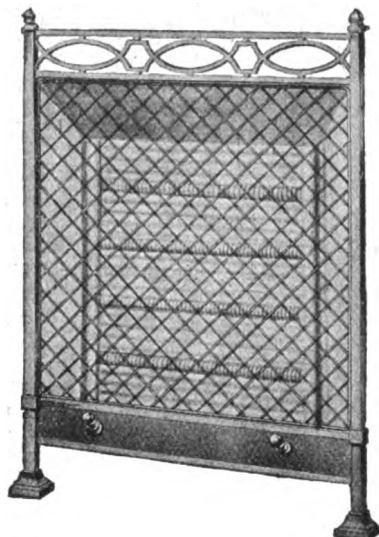


FIG. 2.—ROD TYPE.

heaters, which are particularly light in weight, are finished in iron, copper, or brass in the Modern, Adam, Sheraton, and Georgian styles.

Another form is the rod type, shown in Fig. 2. Each heating element consists of a fire-resisting insulator rod, reinforced by a central steel rod, and having fine grooves arranged helically on its surface. These grooves accommodate a special non-oxidising metal wire. At the end of each rod connection is made by the end turns of the wire to a specially large surface nickel terminal strip, so that this runs perfectly cool. Each rod is designed for a power consumption of 500 watts, and the terminal fits into vertical metal strips of substantial size at the side. The standard sizes are for 1,500, 2,000, and 3,000 watts. Behind the rods, at a suitable distance, is a curved aluminium reflector. We understand that the General Electric Co., Ltd., is inaugurating a novel scheme whereby those interested in the supply of heaters on a large scale for sale, hire, or hire-purchase, will be able to extend considerably their activities, and they are recommended to apply to the Heating Department of the General Electric Co., Ltd., at 67 Queen Victoria Street, E.C., for particulars, as well as for information and advice, on all heating problems.

**Cinematograph Transformers.**—A special series of transformers for use in stepping down the supply voltage to a value suitable for cinematograph arc lamps where alternating current is available, has been standardised by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.). Such an arrangement is of course much cheaper than a motor-generator, and is far more efficient than the use of resistances.

**Smart Emergency Work.**—The British Thomson-Houston Co., Ltd. (Rugby), send us a translation of an extract from the *Jewish Express* describing a breakdown to two motors used for driving the machines on which that journal is printed. Application was immediately made to the Stepney Borough Council's Electricity Department, and within three hours a new nine h.p. B.T.-H. motor was installed, so that printing could be continued without interruption.

## ELECTRIC SIGNS

A GREAT variety of different forms of electric signs suitable for all sorts of positions is made by Simplex Conduits, Ltd. (Garrison Lane, Birmingham). A new one



AN EFFECTIVE ELECTRIC SIGN IN BIRMINGHAM.

just erected in Birmingham is illustrated here. It is a three-sided sign, over 25 ft. high, each letter measuring 24 in., alternate spaces being arranged as doors for changing lamps or inspection purposes. Twenty-four 50-c.p. lamps are used for lighting, the sign being legible at a great distance.

## NEW VELURIA GLASSWARE

WE are informed by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), that the demand for Veluria direct-lighting reflectors and shades has increased so rapidly that they have thought the time opportune for introducing this form of glassware in a number of other forms suitable for semi-indirect lighting, for which, with its beautiful pearly-white appearance, it is particularly suitable.

A new folder, artistically printed in colours, has just been issued by the Company, and contains illustrations and prices



FIG. 1.—VELURIA "URNOLITE."

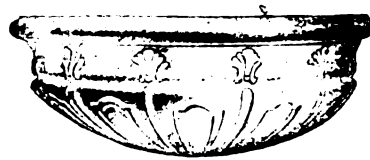


FIG. 2.—VELURIA DISH.

of the various forms of Veluria glassware for semi-indirect lighting. Several patterns of semi-indirect bowls, in diameters ranging from 12 in. to 20 in., suitable for single Mazda lamps of from 40 to 400 watts, are included, in addition to Veluria spheres, "Urnolites," and the more familiar patterns of direct-lighting reflectors. The back cover contains illustrations and prices of a number of special fittings suitable to their glassware. Two examples are illustrated here, and we may mention that the prices at which they are listed are quite moderate.

**Guarantee of Goods Supplied.**—In the Shoreditch County Court last week the Splitdorf Electrical Co. (City Road, E.C.) sued Mr. F. W. Baker, of Stourbridge, for £3 owing on an account for a motor-car electric lighting outfit, which had been withheld owing to alleged faultiness of the battery forming part of the equipment. The defence contended that there was no guarantee of the battery, and that it had been treated improperly. After some argument the Judge found that the battery had been used properly, but had fallen to pieces, and that there was an implied warranty with its sale. Judgment with costs was given for defendants.

## SIEMEN'S CABLES AND JOINT BOXES

TWO very comprehensive new lists have been issued by the cable department of Siemens Bros. & Co., Ltd. (Woolwich), one dealing with paper-insulated cables and the

for wire-armoured cables. It will be seen that the sheathing wires are clamped to the box by means of a tinned brass plate, held in place by a heavy cast-iron clamp. When the cable is double wire-armoured, the wires of the inner sheathing are passed through the plate and flanged out against the box end. The outer sheathing wires are then flanged out, and clamped between the brass plate and the outer cast-iron clamp. The brass plates are connected by a copper bonding strap or strand, and a thoroughly good and efficient bond between the cables entering the box is thus formed which is not dependent in any way on the conductivity of the cast-iron box, as the galvanised iron wires make excellent contact on the sides of the brass plate. In order to

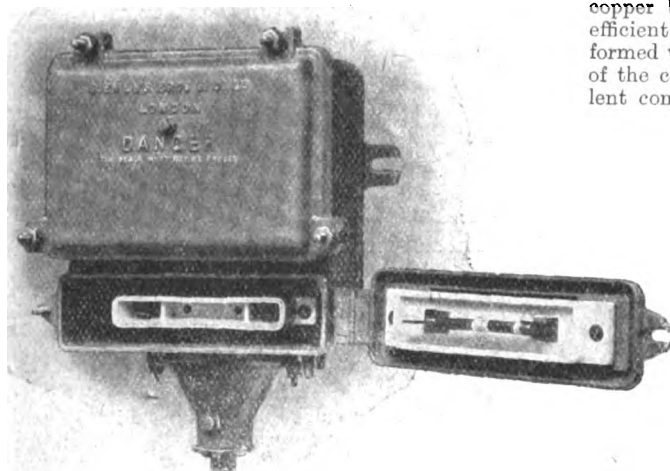


FIG. 1.—WALL TYPE TRANSFORMER BOX.

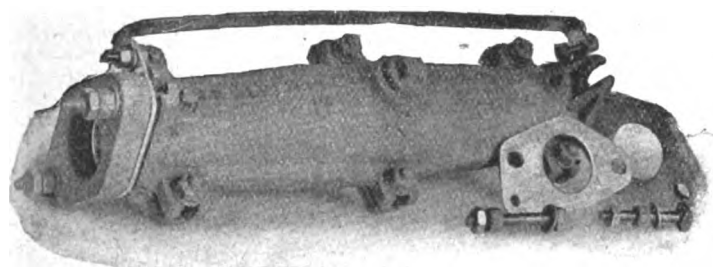


FIG. 3.—STRAIGHT-THROUGH JOINT BOX, SHOWING METHOD OF BONDING ARMOURING.



FIG. 2.—3,000-WATT TRIFURCATING BOX.

other with joint boxes. Paper-insulated cables are dealt with of every class up to 11,000 volts, and some very fine examples are illustrated. The interest is also added to by the views of the works and testing rooms. The cable joint-box list is one of the most comprehensive that we have seen, and includes full descriptive information on feeder pillars, disconnecting fuse and link boxes, sealing ends and end dividing boxes, straight joints, tee and service boxes, house service fuse boxes, crane connection boxes, mining gear, and general accessories.

Among the items to which attention may be drawn are the disconnecting fuse boxes with standard porcelain-handle fuses, and fittings effectively insulated by substantial porcelain insulators carried in a metal plate, and with their tops standing above the compound level. In Fig. 1 is shown a neat design of transformer wall box for circuits up to 2,200 volts. This is also made for D.P. fuses. A very complete series of end dividing boxes is included. One of these, a vertical 3,300-volt box, for mining cable, is illustrated in Fig. 2. It will be noticed that these boxes are designed to be used with bare copper connections, the deterioration of the india-rubber connections due to the presence of ozone being avoided. The end boxes are sufficiently complete to enable engineers to select standard articles to suit any relative position of cable trench and switchboard. An end dividing box, and inverted boxes for overhead lines, are also listed for pressures up to 20,000 volts. Other interesting items are the special crane boxes, which the firm has supplied for many years in large numbers for use at home and abroad on quays, docks, &c.

A separate section is devoted to mining accessories, while the Home Office Regulations for the use of electricity in mines is given *in extenso* in an appendix, which forms a very useful feature of this list. Fig. 3 illustrates a straight-through joint-box, and shows the standard bonding method adopted

ensure that the lead sheathing is also earthed, it is independently connected by a copper strip clamp at each end of the box.

## THE NIGHTINGALL ELECTRIC COOKER

AN interesting form of electric cooker provided with automatic means of heat regulation is described in a new leaflet issued by the General Electric Co. The Nightingall



FIG. 1.—NIGHTINGALL OVEN.



FIG. 2.—NIGHTINGALL STEAMER.

oven, which is shown open in Fig. 1, is of substantial construction, and is double-cased and lagged with a three-inch

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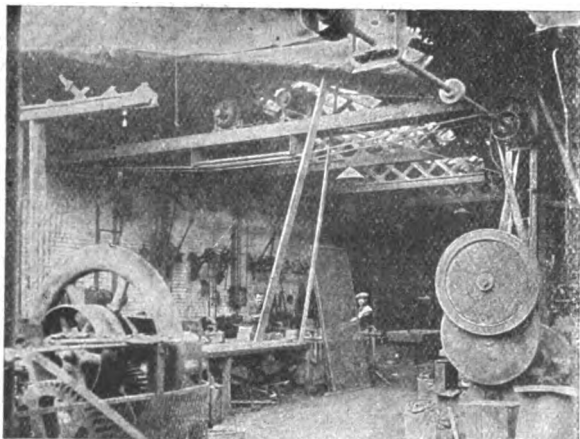
thickness of heat-insulating material. The heating element, which is rated at 1,800 watts, is placed at the bottom. It is easily removable, and is protected by a wire frame. The most interesting part of the apparatus is the heat-regulating arrangement. A thermometer in a slot at the back of the cooker is fitted with five platinum contacts which represent the common terminal and steps of 200°, 300°, 400°, and 500° F. As the mercury rises in the thermometer, it brings into action a solenoid switch situated in the front of the cooker, and this switch cuts off current as soon as the heat of the oven has arrived at the predetermined temperature. A multiple-contact switch puts any one of these contacts into action, so that the oven can be kept at any one of the temperatures mentioned above at will.

The Nightingall steamer (Fig. 2) is constructed on similar lines to the oven, as far as the body is concerned, but is smaller. It is also automatically heat-controlled, but instead of four temperatures like the oven, it has only two—high, which equals a steam pressure of about 2 lb., and low, which is just about boiling point. The door is well lagged to prevent undue waste of steam. The current consumption is 800 watts only. In the bottom of the steamer is a well or water-containing space in which is placed an immersion heater, the connection to which is made in a joint at the back.

### A TALE OF TWO MOTORS

THAT the electric motor is of sturdy construction and capable of withstanding the most disadvantageous conditions is a claim that has been frequently made, and its validity is well borne out by the following example which has been sent us by the British Thomson-Houston Co., Ltd. (Rugby).

Two 10-h.p. squirrel-cage induction motors at the works



MOTORS IN WOODEN ROOF PRACTICALLY UNDAAGED BY FIRE.

of Samuel Wheeler & Sons, Ltd., Smethwick, were employed to drive a number of machine tools, and were mounted on beams in the wooden roof of the building. Just over a week ago a fire broke out, by which a large portion of the roof was destroyed. The two motors, although not actually in the fire, were so near as to be in danger of suffering serious damage from the intense heat, the roof truss on one side of them being totally destroyed, while that on the other side

was badly charred. A steady stream of water was therefore directed upon the motors by the fire brigade, and, as these were of the ordinary protected type, the windings received a severe drenching. Half-an-hour later, when the fire was finally subdued, it was found that, although the motors were thoroughly drenched and had been subjected for half-an-hour to the action of the smoke and steam emitted from the burning roof when the hose was played on it, they started up quite satisfactorily when the current was switched on. The two machines in question were manufactured and supplied by the B.T.H. Co. nearly two years ago, and, we are informed that they had given no trouble whatever until the outbreak of fire, and still continue to give every satisfaction.

### SPRAYERS FOR ENAMEL



WE have on more than one occasion referred to the economies which can be effected by the use of mechanical sprayers in distributing lacquers, paints, varnishes, &c., over large surfaces, and to the apparatus for this purpose supplied by the Fredk. Crane Chemical Co. (Armoury Close, Bordesley Green, Birmingham). The firm have now introduced a special sprayer for use with celluloid enamels, which gives a particularly fine even finish. Those interested are invited to apply for a copy of a descriptive booklet, or to attend demonstrations at the Company's central depôt, 22 Newhall Hill, Birmingham.

**Hotel Lighting.**—The Midland Adelphi Hotel at Liverpool is equipped with electric light fittings manufactured by the General Electric Co. (67 Queen Victoria Street, E.C.) in the following apartments. Main hall, entrance hall, French restaurant, dining-room, Sefton room, grill room, banqueting room, Masonic temple and annexe, lower lounge, smoking room, American bar, all bedrooms, toilets, and corridors, &c. The bedroom lighting is particularly worthy of notice on account of the restful effect produced. In addition to handsome bronze brackets over the beds, semi-indirect fittings are provided for the main illumination, consisting of Osram lamps in heavily moulded "Equiluxo" glass bowls suspended by silk cords.

**The Laboratory of the American National Electric Lamp Association.**—We are informed by Mr. E. P. Hyde, Director of the Physical Laboratory of the National Electric Lamp Association, will in future be known as the "Nela" Research Laboratory, national lamp works of the General Electric Co., Nela Park, Cleveland, Ohio, and its Abstract-Bulletin and other publications will appear under this name.

**"Mazda House News."**—The April issue of this popular little journal is now before us, and contains, among numerous illustrations, a number of examples of new methods of effecting indirect lighting by concealed reflectors, as well as other technical and humorous items. The possibilities of half-watt lamps for photographic work are dealt with, and details are given of the special Mazda focus lamp for optical and projection work.

**John E. Raworth,**  
Queen Anne's Chambers,  
30, Broadway, Westminster, London, S.W.  
Chartered Patent Agent

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Aylesbury.**—A Local Government Board inquiry was held last week concerning a loan of £21,323 for the Council's electric lighting undertaking.

**London: Hammersmith.**—The Electricity Department requires air-cooled static transformers and earthenware cable ducts. Borough Electrical Engineer. May 27th. (See advertisement on another page.)

**Hampstead.**—The following are the details of additional plant referred to in our last issue:—One 1,500-kw. mixed-pressure turbo-alternator, £4,700; cooling tower, tanks, and foundations, £1,800; condenser and pipework, £800; cables, switchgear, £300.

**Woolwich.**—The Local Government Board has sanctioned a loan of £18,000 for electrical extensions.

**Leeds.**—Water-tube boilers, mechanical stokers, economisers, induced-draught plant, &c. Manager, Electricity Department. June 10th. (See advertisement on another page.)

**Liverpool.**—Twelve months' supply of electrical fittings for the Liverpool overhead railway. General Manager, June 2nd.

**Manchester.**—Twelve months' supply of electrical stores, including dynamo brushes, lamps, cables, &c.

**Rangoon.**—The Rangoon Electric Tramway & Supply Co. is issuing new capital in order to lay down the necessary plant to meet increasing demands.

**Skelton and Brotton.**—The L.G.B. has sanctioned a loan of over £9,000 for the electric lighting scheme on condition that the Board of Trade give their consent to overhead wires.

**Stockport.**—Additional plant is to be installed at the power station.

**Sunderland.**—Increasing applications for electric power are coming in; one large power user has applied for an increased supply, and a fifteen years' agreement has been arranged, commencing with 425 kw., and for a maximum of 1,000 kw. An expenditure on low-tension distribution cable will shortly be made.—The Parks Committee has applied for a supply of current for additional illumination, and it is proposed to utilise from 800 to 1,000 lamps.

**Walsall.**—It is understood that the Electricity Committee will ask the Corporation to adopt the recommendation of Mr. E. M. Lacey, the Consulting Engineer, to erect a new power station at an estimated cost of £74,850.

### Wiring

**Edinburgh.**—Electric lighting of King's Park School. Architects, Crawford & Cumming, 41 George Street. May 18th.

**London: L.C.C.**—760 wiring points at Furzedown Training College, Tooting, S.W. (See an advertisement on another page.)

**St. Marylebone.**—The Guardians invite tenders for the electric lighting of the infirmary at Rackham Street, Ladbroke Grove. Clerk to Guardians, Northumberland Street, W. May 18th.

**Monmouth.**—Electric lighting of the Salisbury Club, Corporation Road.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Carlisle.**—New technical school. Town Clerk.

**Blackburn.**—Convalescent home (£3,000).

**Bournemouth.**—A £60,000 pavilion scheme has been inquired into by the Local Government Board.

**Croydon.**—Twelve houses, Raymead Avenue. C. Banks, 16 Oakfield Road.—Twenty-two houses, Enmore Avenue, J. B. Hemmings, Addiscombe.—Forty houses, Parkview Road, A. C. P. Duckit, 24 Sherwood Road.—Twenty-six houses, Galpin's Road, D. Weightman, 78 North End.

**Falkirk.**—Extensions to infirmary.

**Manchester.**—Headquarters for East Lancashire Territorial Association. Secretary, National Buildings, St. Mary's Parsonage.

**Newcastle-on-Tyne.**—New town hall.

**Nuneaton.**—Extensions to High School for Girls (£8,000).

**Sheffield.**—Cinematograph theatre. Architect, J. E. Whitehead, 38 Bank Street.

New school, Northfield Road. Secretary, Education Committee.

**Stretford.**—Erection of St. Peter's Church. Architects, Woodhouse & Howard, 86 Mosley Street, Manchester.

**York.**—Elementary school at Bilton. Architect, F. Raney, 24A Coney Street.

### Miscellaneous

**Ashton-under-Lyne.**—Two electric lifts for the workhouse hospital at a cost of £666.

**Australia.**—The Melbourne City Council requires 1,132,000 arc-lamp carbons. Specification at Messrs. McIlwraith, McEacharn & Co., Bilter Square Buildings, E.C.

**Dublin.**—A.C. prepayment meters. City Electrical Engineer. May 25th. (See advertisement on another page.)

**Morecambe.**—The electrification of the tramways is being considered.

## TENDERS RECEIVED AND ACCEPTED

**Belfast.**—Among the contracts for stores accepted for the coming year are the following:—Ediswan carbon lamps; G.E.C. metal-filament lamps and fuses; B.I. & Helsby Cables and A. Wiseman, overhead line materials; Callender's cables; W. H. Keys, bitumen; India-Rubber Co., tapes; Dussek Bitumen Co., joint-box compound; W. Lucy & Co., feeder pillars; Sloan Electrical Co., arc-lamp carbons; Doulton, troughing; Chamberlain & Hookham, meters; Venner, time switches; and Reason maximum demand indicators.

**Devonport.**—The tender of Messrs. James Howden & Co. has been accepted for a 1,250-kw. Howden-Siemens turbo-alternator, and that of Messrs. Bruce Peebles & Co. for motor-converters.

**London: G.P.O.**—An order has been placed with Siemens Bros. Dynamo Works for Wotan drawn-wire lamps up to and including 50 c.p.

**Torquay.**—The tender of Messrs. Babcock & Wilcox has been accepted for boiler plant at £3,352.

**Wallasey.**—The following tenders have been accepted:—Turbo-alternator, British Westinghouse Co.; boilers, Babcock & Wilcox; economiser, E. Green & Sons; E.H.T. cables, British Insulated & Helsby Cables; switchboard, Crompton & Co.; overhead crane, Carrick & Sons; rotary-converters, British Thomson-Houston Co.

## APPOINTMENTS AND PERSONAL NOTES

Dr. T. E. Stanton, Superintendent of the Engineering Department of the National Physical Laboratory, has been elected a Fellow of the Royal Society.

Mr. G. Nicolson (Chief Assistant Engineer, Weymouth) has been awarded the Dorset Field Club's "Cecil" silver medal and £5 for an essay on the production of electricity for domestic purposes.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £65 5s. to £65 15s. (Last week, £65 15s. to £66 5s.)

The Midland Electric Corporation (1900, Ltd.) is being wound up voluntarily.

A first and final dividend of 8s. 10d. in the pound is to be paid in the bankruptcy of C. Blake, trading as the Bilston Electric Co.

**New Branch Office.**—Fraser & Chalmers, Ltd. (3 London Wall Buildings, E.C.), have opened a branch office in Manchester, at 90 Deansgate.



**Change of Address.**—E. G. Appleby & Co. have removed to more extensive premises at 12 The Broadway, Westminster.

**Bankruptcies.**—Lord Templetown, who figured in the London Bankruptcy Court last week, started in 1904 as an electrical engineer in Craven Street, Strand, as Dorrington & Co. According to the statement made to the official receiver, very little business was done, and the Company then moved to 17 Victoria Street, S.W.

The bankruptcy of Mr. Harry Horne, which was inquired into at the London Bankruptcy Court last week, was attributed partly to the non-success of the Bryant Trading Syndicate, in connection with which a number of loans had been guaranteed by Mr. Horne.

## LOCAL NOTES

**Bristol: Dispute with Wiring Contractors.**—The Bristol Electrical Contractors' Association and the Corporation Electricity Department are in conflict as to the manner in which the present arrangement between the two parties is carried out. The contractors now work to a specification compiled by the Department, which, however, supplies the lamps, fittings, switches, &c., and takes the profit upon them as some recompense for having to maintain a showroom. The contractors complain that this method leaves very little profit, if any, to the contractors, who have to take all the responsibility for carrying out the work. Mr. H. Faraday Proctor, the City Electrical Engineer, has replied to the effect that the present arrangement has been forced upon the Council by the different methods carried out by various contractors, and that he is not at all sure he is justified in giving out to contract even so much of the work as is done at present. The matter has been before the Electricity Committee, which agrees with Mr. Faraday Proctor that no change should be made in the present arrangement.

**Burton-on-Trent: Assisted Wiring Scheme.**—In reporting a net profit of £3,055 for the past year's working on the electricity undertaking, the Borough Electrical Engineer says there is no doubt that with an assisted wiring system the sale of electricity for lighting would increase at a very rapid rate. There has been an increase of 62 per cent. in the sale of current for heating and cooking purposes for 1913-14, and it is noteworthy that, although the total output increased by approximately 400,000 units, the actual working expenses decreased by £97.

**Edinburgh: Expenditure on New Power Station.**—The Electric Lighting Committee proposes to spend an additional £59,250 on capital account during the coming financial year, of which £30,000 will be the first instalment of the cost of the new generating station at Portobello.

**Kingstown: Gas Co.'s Defeat.**—We reported in our last issue the defeat of the Dublin & Alliance Gas Consumers' Co. in its application for electricity powers in Kingstown, Dalkey, and Blackrock. Since then the Gas Co. has suffered another defeat. The Dublin Southern District Electric Supply Co. has now been granted an order for Kingstown, with an option to the U.D.C. to take over the powers within six months. At the close of the proceedings on this order, and in consequence of the option given to the Council to purchase the Gas Co.'s order, an application was made for the insertion of the "Northumberland" clause in the event of the Council taking over the powers. Here, again, the Gas Co. was unsuccessful. The fight between the Gas Co. and the Dublin Southern District Electric Supply Co., with which Mr. W. M. Murphy is connected, has been a very long and costly one, and has been mainly due to the endeavour of the Gas Co. to prevent competition from electricity supply by another company than itself.

**Leeds: Charging for Electric Vehicles.**—At the last meeting of the Corporation, Mr. R. Armitage, M.P., moved to refer back a recommendation that current for charging electric vehicles should be charged at 1d. per unit. He contended that this is not a rate which will encourage the use of electric battery vehicles in Leeds, and urged the adoption of a lower one. The Chairman of the Committee, however, pointed out that 1d. per unit was not intended to be a definite rate for the purpose. It related in this case merely to the charging of one vehicle, and if other people came along the Council could be assured that the Committee would take a business-like view of the matter.

**London: Hammersmith: Thames Circulating Water.**—Owing to some cleaning operations up the river, the strainers for the river circulating water at the electricity works have had to be

cleaned several times a day. At low tide this is done by men wearing waders, but at other times by the use of a boat, which is expensive and unsatisfactory. When the condensing plant was put down originally it was suggested that the pipes should be arranged so that either pipe could be temporarily used as a discharge pipe. This was not considered necessary at the time, but it is now to be done.

**I.M.E.A. Meeting.**—The Chairman and Vice-Chairman have been chosen as delegates, and their convention fees will, as hitherto, be paid out of the funds of the undertaking.

**St. Pancras: M.E.A. Delegates.**—Alderman G. Hickling and Councillor W. C. Wood have been appointed delegates to the I.M.E.A. meeting next month, and they have undertaken to pay their own expenses.

**Loughborough: Meeting Gas Competition.**—The Chairman of the Gas Committee has been making comments upon a proposal by the Electrical Engineer, which will have the effect of strengthening the competition with gas. The proposal of the Electricity Committee is to lay mains in a certain new street, and to supply villas and cottages there with lighting current at a fixed charge per week. The Chairman of the Gas Committee frankly states that this will affect the Gas Department, and the whole theme of his remarks was that any serious efforts made to develop the electrical undertaking would make the gas undertaking a non-paying concern. The comments in question do not appear to have met with a great deal of sympathy in the Council.

**Manchester: Purchase of Trafford Power Co. Refused.**—The bill of the Corporation, to which reference was made last week, has now been finally dealt with by a House of Lords Committee, presided over by Lord Barnard. The Committee refused to allow the Corporation to purchase the undertaking of the Trafford Power & Light Supply Co., and also struck out of the bill clauses extending the Corporation's area of supply into Stretford, Trafford Park, and Davyhulme. The proposal to erect a new power station at Davyhulme, however, is unopposed, and remains in the bill.

**Scarborough: Purchase of Supply Co. Abandoned.**—As we have previously announced, the Corporation has been inquiring of the Scarborough Electric Supply Co. as to a possible purchase of the Company's undertaking. As the result, however, of a communication just received from the Company, the Property Committee, which has had the matter in hand, recommends that no further steps be taken.

**Tunbridge Wells: Supply outside Area.**—The Council has received sanction under the Electric Lighting Act of 1909 to supply certain premises outside its area. Following its usual practice, the Board of Trade has informed the Council that if it becomes necessary to supply other premises in the same district, it would be better for the Council to promote an electric lighting order for a general supply in this district.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Electric Construction Co.**—A 6 per cent. dividend is recommended on the ordinary shares for the ten months to March 31st.

**Craigpark Electric Co.**—A 6 per cent. dividend is recommended on the ordinary shares for the year to March 31st, carrying forward £1,941.

**Kent Electric Power Co.**—There was a net profit of £4,539 for 1913, and the directors propose to pay all arrears of dividend on the 6 per cent. cumulative priority shares to December, 1912, and also the same dividend for 1913, leaving a balance of £155 to be carried forward.

**British Thomson-Houston Co.**—There was a net profit of £77,044 for 1913, and of this the sum of £64,100 has been appropriated to depreciation and reserve. The balance of £12,944 is carried forward. The Company's works at Rugby, Coventry, and Willesden are reported to be in good condition, and the manufacture of switchboards and appliances has now been completely concentrated at Willesden. The financial result is a marked improvement over previous years.

**Obituary.**—The death occurred at Antibes, on Saturday, of M. Paul Héroult, the French electro-metallurgist. His name is well-known from the Héroult furnace, used to a considerable extent for electro-metallurgical work. He patented a method of manufacturing aluminium in the electric furnace in 1887, which was first tried on a commercial scale in Switzerland in the following year. His electric steel furnaces are in use in America, as well as Great Britain.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 386 [VOL. X., No. 21]  
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THURSDAY, MAY 21, 1914.

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## ELECTRICAL ENGINEERING.

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE Electrical Trades Union are insisting on extravagant demands with regard to wiremen's wages, etc., in Liverpool, and the newly-formed Liverpool and District Electrical Masters' Association definitely refuse to concede them. (Page 278.)

THE L.C.C. has voted a further £3,500 for its investigation with regard to the London Electric Supply Scheme. A motion that the Committee should report definitely early in July was defeated at the meeting of the Council on Tuesday. (Page 278.)

REDUCTION gearing is coming into use for driving slow-speed continuous-current generators by high-speed turbines. A set in which this is done at the Horseferry Road Station of the Westminster Electricity Supply Corporation is described in an illustrated article. (Page 279.)

AMONG the Papers before the Iron and Steel Institute at the meeting this month, one, by Sir R. Hadfield and Prof. B. Hopkinson, dealt with the magnetic properties of manganese steel; and another, by Prof. Benedicks, gave results of some experiments on ferro-magnetic mixtures. (Page 280.)

WE give the result of the ballot for the new Council of the Institution of Electrical Engineers, and explain the circumstances which have led to the dissolution of the Industrial Committee. The membership of the Institution has decreased slightly since last year. A list of the premiums awarded is given, and other information from the Annual Report of the Council, which will be considered at the Annual General Meeting to-day. (Page 281.)

THE final programme of the Birmingham convention of the Incorporated Municipal Electrical Association has now been issued. (Page 281.)

THE Oxford City Council has decided to agree with the National Electric Construction Co. for the institution of a service of motor omnibuses instead of reconstructing the horse tramways for electric traction.—The Leeds Corporation's proposal to run a trolley omnibus line to Wharfedale has been passed by Parliament.—Extensions are being made to the Ramsbottom trolley-omnibus scheme, and experiments are being made with this form of electric traction by the Shanghai Electric Construction Co. (Page 282.)

WIRELESS telephony has been accomplished between Nauau and Pola. The Cefndu transatlantic wireless station, near Carnarvon, is approaching completion. (Page 282.)

THE heating of transformers and the meaning of the term heating time-constant is discussed in our Questions and Answers columns. (Page 283.)

AMONGST the specifications published last week were some relating to automatic telephony, manufacture of tungsten, and the ventilation of A.-C. motors. Three lapsed patents have been restored. A patent for electrolytic bleaching expires this week after a life of fourteen years. (Page 284.)

SEVERAL new installation accessories are described in our Trade Section, which also contains articles on church lighting, telephone apparatus, arc lamp lowering gear, a new thermopile and a fire extinguisher. (Pages 285 to 287.)

LARGE schemes of electrical extensions are to be carried out at Walsall, Watford, Leigh (Lancs.), Bury, and Stockport; cable is required at Cleckheaton; water-tube boiler and cooling tower at Darlington; motor-driven induced draught plant at Leeds; two 2,000 kw. steam turbines at Oldham; switchgear at Shanghai; and oil-break switches in Wellington (N.Z.). (Page 288.)

A GENERAL improvement in trade conditions was reported at the annual meeting of Callender's Cable & Construction Co. last week. (Page 288.)

THE Hove Corporation has been advised to retain the late Company's undertaking in its own hands, but two recent offers to lease it are being considered.—It has been decided to retain the separate control of the Glasgow tramways and electrical undertakings.—The Carlisle Corporation has decided to enforce a minimum of 30s. per annum upon its electric lighting consumers.—An investigation is to be carried out as to street lighting generally in Edinburgh.—The power load at Rotherham has been doubled during the past year.—Mr. Duncan Watson has presented the Marylebone Electricity Supply Department with an electric vehicle chassis. (Page 289.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, MAY 21st.

*Institution of Electrical Engineers.*

5 p.m. Annual General Meeting.

*Illuminating Engineering Society.*

7.30 p.m. Annual General Meeting. "The Nomenclature and Definitions of Photometric Quantities," by A. P. Trotter.

FRIDAY, MAY 22ND.

*Physical Society.*

5 p.m. At Imperial College of Science. The Agenda includes "Experiments with an Incandescent Lamp," by C. W. S. Crawley and S. W. J. Smith.

SATURDAY, MAY 23RD.

*Association of Mining Electrical Engineers.*

2 p.m. Notts and Derbyshire Branch. Visit to Grassmoor Collieries.

MONDAY, MAY 25TH.

*Association of Consulting Engineers.*

4.30 p.m. Annual meeting at Caxton Hall, Westminster, S.W.

THURSDAY, MAY 28TH.

*Institution of Railway Signal Engineers.*

2.30 p.m. At Institution of Electrical Engineers. "American Signal Practice as Compared with British Practice," by A. H. Rudd.

### The London Electrical Engineers.

Headquarters (46 Regency Street, S.W.) open Sats. till noon.  
Rating Exam. for all Cos. from 7 to 10 p.m. every Wednesday.  
Annual course of musketry at Purfleet for all Companies, Wednesday, May 27th.

(TO-DAY) THURSDAY, MAY 21ST, C. Co. FRIDAY, MAY 22ND, D. Co.  
MONDAY, MAY 25TH, A. Co. TUESDAY, MAY 26TH, B. Co.  
THURSDAY, MAY 28TH, C. Co. FRIDAY, MAY 29TH, D. Co.

### WIREMEN'S WAGES IN LIVERPOOL

AS stated in our issue of March 26th (p. 174), the Liverpool wiremen are demanding an increase in their wages from 9½d. to 1s. an hour, and other concessions. We also announced in the same issue that an association of masters was being formed to deal with the situation. This will be a permanent body—the "Liverpool and District Masters' Association," and over seventy firms have joined it. The

Chairman is Mr. A. E. Gregson (Northern Electrical Ventilating Co.), the Vice-Chairman, Mr. H. T. Boothroyd, the Hon. Sec., Mr. F. G. Pulford (108 and 110 Whitechapel, Liverpool), and the Hon. Treasurer, Mr. S. McLeigh (John Hunter & Co.). The other members of the Committee are:—

Mr. F. W. Smith (Herd & Smith), T. W. Robson (T. W. Robson & Sons), A. E. Chesters, J. O. Rhodes (Electric Light & Engineering Co.), J. Scott (J. Scott, Ltd.), J. Boulton (John Boulton & Co.), H. L. Downes (Downes & Davies), F. B. Hellon (Hellon & Co.). An entertainment committee has also been elected to look after the interests of the members on the social side, and the first smoking concert will be held on Friday, May 29th, at 7.45 p.m., at St. George's Restaurant; all intending members are cordially invited.

The Hon. Sec. points out that the Electrical Trades Union, which is organising the disturbance, has had to be content with far lower wages for its members in London and Manchester than those demanded in Liverpool. In London the men on strike are only asking for 10½d. an hour, and in Manchester a settlement has been arrived at for two years for 9½d. an hour.

The members of the Masters' Association are unanimous in their resolve not to grant these demands, and at a conference with the delegates of the E.T.U., held last week, the Union officials were informed that none of their demands could be considered. The masters state that, in the event of a strike, they are fully organised to carry out the most urgent work on hand with non-Union labour.

**The London Electricity Supply Scheme.**—At the meeting of the L.C.C. on Tuesday, a resolution was moved instructing the Special Committee on London Electricity Supply to lay a report before the Council not later than the second Tuesday in July. The main reason put forward in favour of the resolution was that there has been too much delay in regard to this important matter, and that some definite scheme should now be placed before the Council following on the report by Messrs. Merz & McLellan. Eventually the resolution was defeated, it being stated that the needs of the Council will be met if a scheme is prepared in time for the next Parliamentary session. The discussion arose in connection with a vote of £3,500 for further investigation. It was mentioned that the Special Committee has been taking expert evidence for twenty-eight months.



The Industrial Committee of the Institution of Electrical Engineers is unable to make progress.

## A GEARED TURBO-GENERATOR

**T**HE use of gearing in conjunction with steam turbines has been adopted to a considerable extent for both land and marine purposes. In the latter case its function is to permit of the turbines and propellers both running at speeds conducive to their highest possible efficiency—speeds which are high in the case of the turbine and low in the case of the propeller. The application of the geared turbine to the drive of elec-

also connected in series to reduce the voltage on each commutator. With the general increase in the size of generating units, however, there is a growing need for some other solution to the problem, and practically speaking the choice may be said to rest between using a turbo-alternator in conjunction with a rotary converter or providing a speed reduction gear between the turbine and the dynamo; for there is no electrical difficulty

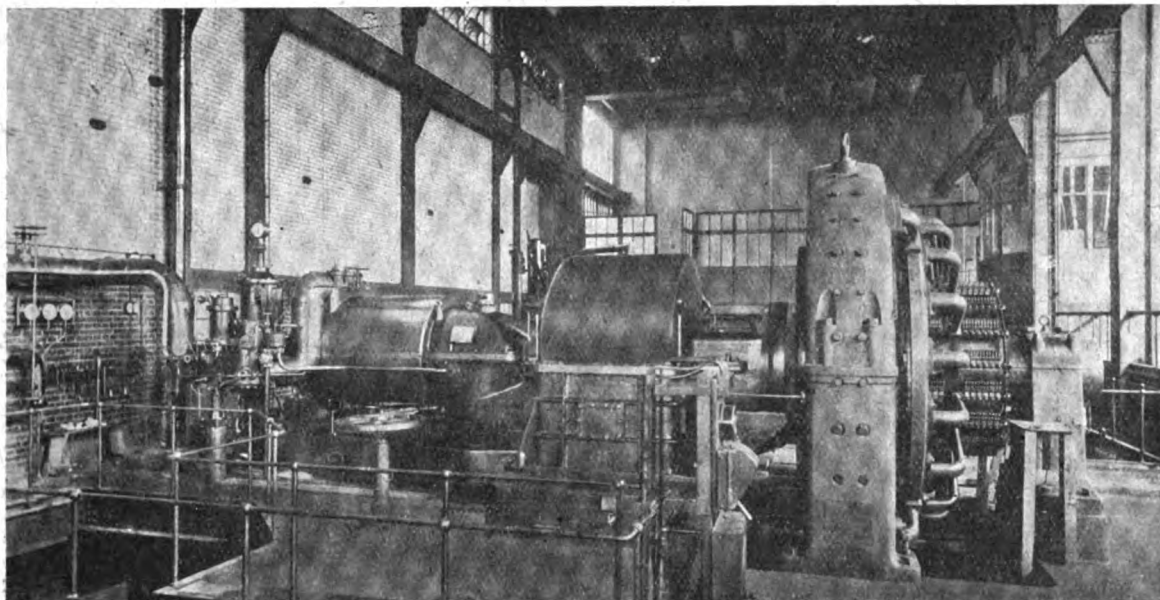


FIG. 1.—GENERAL VIEW OF 1,500 kW. GEARED TURBO-GENERATOR.

trical generating plant was also developed simultaneously. In the case of alternating-current plant, the speed conditions which suit the turbine can generally be met satisfactorily by the generator, and turbo-alternators of large size running at 3,000 r.p.m. are in use with successful results. The problem with continuous-current plant is different, however. Large high-speed continuous-current generators present difficulties in design from both mechanical and commuta-

in constructing large continuous-current units of high efficiency running at moderate speeds. The former alternative was considered desirable for special reasons in the case of two new sets recently ordered for the MacDonald Road Station, Edinburgh, but for the set we are about to describe at the Horseferry Road Station of the Westminster Electric Supply Corporation, considerations of capital cost in conjunction with the capitalised value of the saving in steam consumption

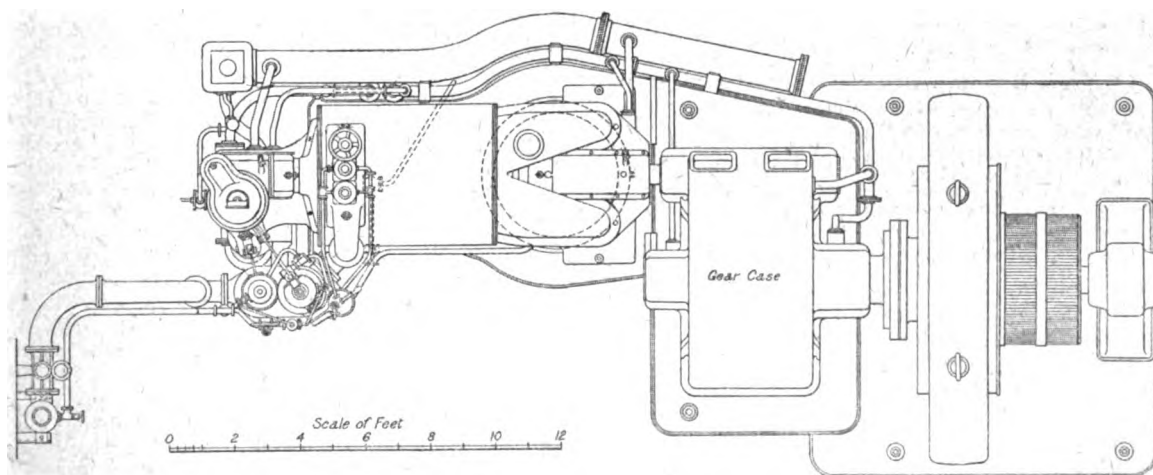


FIG. 2.—PLAN SHOWING RELATIVE SIZES AND POSITIONS OF TURBINE, GEAR CASE, AND GENERATOR.

tion points of view, and as high an efficiency cannot be reached with them as can be with machines running at lower speeds, consequently a sort of compromise has hitherto been arrived at. Turbines running at rather lower speeds than are required to give the highest steam efficiency have been employed, and the electrical portion of the set has often been divided into two separate machines coupled in tandem and sometimes

possibly led to the decision of Messrs. Kennedy & Donkin, the consulting engineers, to adopt a geared turbine.

Quite a number of geared turbines have been supplied by the Parsons Co. for land purposes, the first example being a turbine geared to a rolling mill in Scotland, which has been in continuous successful operation for three years. There are also three Indian jute



mills driven by a combination of gearing and ropes. A 4,000 kw. continuous-current set has also been running at the Bankside Power Station of the City of London Electric Lighting Co., the turbine running at 2,400 revs. and the tandem dynamos at 370 r.p.m. The plant at Horseferry Road is of 1,500 kw. capacity, and has been running regularly since March 31st.

A general view of the set is seen in Fig. 1, and a plan showing its general arrangement is given in Fig. 2. The difference in its appearance from the more familiar style of generating set is very striking, continuing as it does the general tendency of the steam end of the set to get smaller and smaller in proportion to the electrical end. The turbine, which together with the gearing was made by C. A. Parsons & Co., Ltd., is of the impulse-reaction type, with a single initial impulse stage and the usual many rings of reaction blading in one cylinder. It is supplied with steam at 200 lb. per square inch with 150° F. superheat, and runs at 300 r.p.m. The general construction and governing arrangements are in accordance with Messrs. Parsons' standard practice.

As the dynamo runs at 300 r.p.m., the gearing is of ten to one ratio. It is on the same general lines as the Parsons' marine gearing, consisting of two wide helical gear rings with the slope in opposite directions to balance the end thrust. The pinion is solid steel, and the gear-wheel consists of a cast-iron drum, over which are shrunk and keyed the two mild steel rings, each 15 in. wide and about 6 ft. in diameter, in which the teeth are cut. These gears are cut by Sir C. A. Parsons' "creeping-table" method, which he has fully described in Papers read before the Institution of Naval Architects. The gear is lubricated by oil squirted continuously at the line of contact of the teeth. This oil comes from the same pressure system that supplies the bearings. A flexible coupling is provided between the turbine and the pinion shaft, but the armature of the generator is coupled rigidly to the gear wheel shaft. In some other makes of turbine gearing floating bearings are used for the pinion shaft, enabling it to take up its own position, but Messrs. Parsons do not find this necessary, and, in accordance with their usual practice, have fitted solid bearings. The gearing runs wonderfully quietly considering its remarkably high tooth speed, and indeed the whole set is perceptibly quieter on full load than the older ungeared sets in the station.

The generator was manufactured by Siemens Brothers Dynamo Works, Ltd., has a rated output of 1,500 kw. at 400 to 460 volts at 300 r.p.m. It is a very imposing looking machine, with eighteen main poles and an armature about 8 ft. in diameter. It is fitted with commutating poles, and the main poles are laminated. The commutator, which is 4 ft. in diameter, is made in two sections to avoid excessive length of the segments.

The generator is designed on liberal lines as regards solidity and efficiency, and the rated output is such that the temperature rise is well within that guaranteed, and the machine will stand an overload of 25 per cent. for half-an-hour and of 40 per cent. for three minutes without injury or undue heating.

The set stands over its condensing plant in the usual way. A surface condenser, supplied by Willans & Robinson (Rugby), and fitted with the Parsons vacuum augmentor, is employed, and a 28½-in. vacuum can be maintained. A steam-driven air pump is used, supplied by W. H. Allen, Son & Co. (Bedford). The set necessitated extension in boiler plant, which took the form of one Babcock & Wilcox water-tube boiler of 20,000 lb. per hour evaporative capacity, with chain-grate stokers.

With regard to the steam consumption of the set we may say that the guaranteed consumption was satisfactorily realised on test, and a very good result was attained, showing an all-round economy, over a one week run, of about 20 per cent. on the 1,000-kw. direct-driven turbo-sets forming the original equipment of the station.

In conclusion, we wish to offer our thanks to Messrs. Kennedy & Donkin, consulting engineers, to whose specifications the work was carried out, and to Messrs. C. A. Parsons & Co., Ltd., and Siemens' Brothers Dynamo Works, Ltd., manufacturers of the plant, for kindly supplying us with particulars, and to Mr. G. Horley, resident engineer to the Westminster Electric Supply Corporation at Horseferry Road, for permission to inspect and photograph the set.

**Prosecution by London Firm.**—Three employees of Messrs. Duncan, Watson & Co., were charged with stealing, between February 1st and May 12th, from 31 Great Titchfield Street, W., a quantity of wire and fittings valued at £22. A cycle repairer of Berwick Street, Soho, was charged with receiving some of the stolen property, knowing it to have been unlawfully obtained. Mr. Freke Palmer prosecuted, Mr. Barrington Matthews defended. The manager of the prosecuting firm stated that on missing the articles from stock, he spoke to one of the accused, who then made a statement incriminating himself and two other employees. Some of the missing articles were found in the Berwick Street shop of the other accused. The prisoners were remanded, bail being allowed for the last mentioned, in the sum of £100.

## MAGNETIC PROPERTIES OF ALLOYS AND MIXTURES

ONE of the Papers read at the meeting of the Iron and Steel Institute recently described researches into the magnetic properties of manganese steel by Sir Robert Hadfield and Prof. B. Hopkinson. It is now well known that manganese steel containing about 12 per cent. of manganese and 1½ per cent. of carbon, when prepared in the ordinary way, is practically non-magnetic, but that if heated to a high temperature and slowly cooled, can be rendered magnetic. The influence of slow heat treatment is further studied in the present Paper. Samples heated for long periods at temperatures in the neighbourhood of 500° C. were tested magnetically (by a differential method, which compared their permeability with that of a standard piece of nearly pure iron) at intervals, and were found to exhibit a gradual rise in permeability, according to a curve asymptotic to a constant value varying with the temperature. Quenching the specimen did not destroy the magnetic quality thus created, but further heating at temperatures exceeding 640° resulted in a diminution of the magnetic quality at a rate more rapid the higher the temperature, until, at 750° C., the magnetic properties were practically removed in a few minutes. At intermediate temperatures the magnetic quality does not entirely disappear, but ultimately settle down to constant reduced value. The material in the ordinary non-magnetic condition, or in the magnetic condition induced by prolonged heating at 520° C., is unchanged by immersion in liquid air, but in an intermediate condition, after short heating at 500° C., it is rendered more magnetic by immersion in liquid air. It was also noticed that cold working makes the water-toughened material slightly magnetic. Heating and cooling curves showed a change point at about 650° C. The explanation of these effects appears to be that the stable form of the alloy at temperatures below about 750° C. is more or less magnetic, the proportion of magnetic substance present in the equilibrium state diminishing rapidly when the temperature approaches that figure. Above 750° C. the magnetism is all gone. From about 650° C. to 750° C. there is a critical range similar to that corresponding to the loss of magnetism in ordinary carbon steel. If the alloy be cooled from above this critical range, the tendency, as it passes through any lower temperature, is towards the attainment of the amount of magnetism proper to that temperature. But the rate of approach to equilibrium is so slow that even when the cooling takes several minutes, but very little of the magnetism is restored, and the effect produced is similar in kind to that produced by quenching a carbon steel. The important effect of the manganese is, apparently, this retardation of the attainment of equilibrium, rather than any very marked shift of the position of the critical range. The Paper also discusses the mechanical properties and micrographic structure of the material.

The magnetic properties of certain ferro-magnetic mixtures were investigated in another Paper by Prof. C. Benedicks (Stockholm), presented during the meeting. Magnetic measurements were carried out on ferro-magnetic, mechanical mixtures of magnetite (with quartz), iron (with copper), and nickel (with copper), the latter pressed together into solid bars. They proved, in agreement with older measurements, that the magnetic intensity shows a very distinct deviation from a rectilinear depending on the concentration. This is an experimental verification of a previous theoretical curve of the author's, which serves, at least on broad lines, to explain how the assumption of one gradually occurring molecular change (the increased presence of  $\gamma$ -iron with rising temperature in the  $\alpha$ -iron) can agree with the rapid falling of the magnetism within a certain interval.

**Celluloid.**—Further regulations regarding the premises where celluloid is made, worked, or stored have been issued in draft by the Home Office. According to these regulations, amounts of celluloid over 1 cwt. may only be stored in special fireproof chambers. The amount of celluloid in workrooms is to be kept as small as possible, and waste is not to be allowed to accumulate. Open lights and fires are not allowed in cinematograph film rooms, and smoking and the introduction of matches are forbidden in all cases where celluloid is present. Saws for cutting celluloid are to be kept constantly wet, and sealing-wax is not to be used for parcels containing celluloid. Various precautions regarding escape in case of fire are required.

**The "Point Fives."**—It is requested that all those attending the I.M.E.A. Convention who wish to come to the meeting of the "Point Fives" on June 18th, at the Grand Hotel, Birmingham, will send in their names to the Hon. Secretary, Mr. A. H. Seabrook (19 and 20 York Place, Baker Street, W.), as early as possible.

## INSTITUTION OF ELECTRICAL ENGINEERS

### The New Council.

The following is the result of the ballot for the six vacancies on the Council:—

**COUNCIL'S NOMINATIONS:**—*Elected:* Prof. B. Hopkinson, F.R.S., G. W. Partridge, W. H. Patchell, and W. B. Woodhouse. *Not Elected:* W. L. Preece, G. S. Ram, W. Slingo, and A. A. C. Swinton.

**OTHER NOMINATIONS:**—*Elected:* J. Christie and R. J. Wallis-Jones. *Not Elected:* F. Ayton and Haydn T. Harrison.

The other Members of Council are:—

J. F. C. Snell (*President*); W. Judd, C. H. Merz, J. S. Highfield, and C. H. Wordingham (*Vice-Presidents*); R. A. Chattock, F. Gill, W. Rutherford, A. H. Seabrook, Roger T. Smith, and Dr. A. Russell (*Members*); F. E. Berry, A. W. Martin, and Capt. E. O. Henrici (*Associate Members*); A. B. Anderson, E. Russell Clarke, and A. M. J. Ogilvie, C.B. (*Associates*); Robert Hammond (*Honorary Treasurer*).

In addition, the Chairman and a Past-Chairman of each Local Section are *ex officio* members of Council.

### The Industrial Committee.

In the Council's Report for the year, which will be presented at the Annual General Meeting to-day, it is stated that the Industrial Committee has been dissolved. The official explanation of this is that the Committee asked for changes in its constitution and enlargement of its powers to enable it to perform useful work, neither of which requests the Council felt itself to be in a position to grant, and they therefore dissolved the Committee. The facts of the matter are that the Committee found a decided want of sympathy with them on the part of the Council. Various recommendations, we believe, were put forward by the Committee and its members, only to be set aside either by the Council or to be withdrawn on the assurance of the Council's representatives on the Committee that they could not be passed for the reason that the recommendations were of a political or semi-political character, or that they dealt with matters in regard to which the various sections of the membership of the Institution might be in conflict. It is just this latter class of questions with which the Institution should be in the best position to deal, and it is to be regretted that the value of the Institution to the electrical industry should be limited by this statement of policy and by this unnecessarily broad conception of what are "political" issues. We can take two cases as examples. The dispute between the Electrical Contractors' Association and the Municipalities on the wiring question was brought before the Industrial Committee, and a compromise was arrived at which, we understand, only needed the official endorsement of the Institution to make it acceptable to both parties. Although the Committee had thoroughly gone into the matter and recommended the terms arrived at as fair to both sides, the Council refused to confirm the Committee's action. Another case, we have reason to believe, was an endeavour to take action with regard to flotations in the City of schemes for which foreign instead of British plant was to be employed. To take any effective steps in the matter it would have been necessary to invoke the aid of the Press for the purpose of propaganda, but sanction to this was also refused by the Council. Men who have to make a sacrifice to find time to give to Committee work are not likely to continue if they find that their work is constantly ineffective, and it is hardly to be wondered at that something in the nature of an ultimatum was presented, with the result that the Committee was dissolved.

### Decrease in Membership.

The membership of the Institution has decreased from 7,084 on May 1st, 1913, to 7,045 on May 1st, 1914.

### Premiums, Prizes, and Scholarships.

The following awards have been made:—

The Institution Premium, value £25, to Mr. S. Evershed, for his Paper, "The Characteristics of Insulation Resistance."

The Ayrton Premium, value £10, to Mr. F. Lydall, for his Paper, "Electric Locomotives."

The Fahie Premium, value £10, to Commandant G. A. Ferrié, for his Paper, "Application of Wireless Telegraphy to Time Signals."

The John Hopkinson Premium, value £10, to Mr. L. J. Hunt, for his paper, "The Cascade Induction Motor."

The Paris Premium, value £10, to Mr. B. Welbourn, for his Paper, "British Practice in the Construction of High-Tension Overhead Transmission Lines."

An Extra Premium, value £10, to Messrs. K. M. Faye-Hansen and J. S. Peck, for their Paper, "Current-Limiting Reactances on Large Power Systems."

An Extra Premium, value £5, to Mr. S. H. Holden, for his Paper, "The British Standard Specification for Consumers' Electric Supply Meters."

An Extra Premium, value £5, to Mr. F. J. Teago, for his Paper, "Experiments on Air-Blast Cooling of Transformers."

Students' Premiums have been awarded for the following Papers:—"Comparative Tests on Single-Phase A.C. Commutator Motors," by E. A. Richards and D. Dunham. "The Electrical Equipment of Collieries," by H. S. Ripley. "Diseases and Troubles experienced with Transformers," by J. Lindley Thompson. "The Possibilities of Electric Traction on Railways," by J. L. Moffet. "The Laws of Dielectrics," by W. S. Flight. "The Automatic Control of Electrical Generators by means of Automatic Pressure Regulators," by A. Arnold and E. L. M. Emtage.

The Council have awarded a Salomons Scholarship of the value of £50 to C. H. Stubbings, of King's College; and two David Hughes Scholarships of the value of £50 each to John G. Wellings, of the Finsbury Technical College, and to James Mould, of University College, London, respectively.

### Miscellaneous.

Among other matters dealt with in the Council report are the following:—

**Meetings for Specialised Papers.**—The Council have had under consideration the question of some reorganisation of the meetings in order to stimulate interest in the various branches, and to encourage members to take a more active part in discussions on subjects which are of special interest to them. They have therefore appointed a number of Sectional Committees to advise the Council as to the selection of Papers and promotion of discussions of a specialised nature. These will take the place of the Informal Meetings, which were introduced two sessions ago without much success.

**Local Centres Abroad.**—The report states that local centres already exist in Calcutta and Cape Town, and the Council have recently sanctioned the formation of one at Hong Kong.

**Kelvin Memorial.**—The surplus from the fund collected for the Memorial Window to Lord Kelvin is to be devoted to the establishment of a Kelvin Gold Medal to be awarded every three years as a mark of distinction achieved in engineering work of the kinds with which Lord Kelvin was especially identified.

**International Illumination Commission.**—The Council have appointed Messrs. W. Duddell, F.R.S., F. Bailey, K. Edgcombe, Haydn T. Harrison, and Professor J. T. Morris as delegates to the British National Committee, and are contributing equally with the Institution of Gas Engineers towards the expenses of the Committee.

**International Scientific Radio-telegraphic Commission.**—Particulars of the formation of this Commission were given in our issue of October 30th, 1913, page 607. The Institution has formed the National Committee for the United Kingdom of the following members:—Mr. W. Duddell, F.R.S., Dr. W. H. Eccles, Professor G. W. O. Howe, Sir Oliver Lodge, F.R.S., Dr. E. W. Marchant, Sir Henry Norman, M.P., Dr. S. P. Thompson, F.R.S. The first meeting of the Commission was held in Brussels on April 26th, and the delegates were Mr. W. Duddell, Dr. W. H. Eccles, and Dr. E. W. Marchant.

**Engineering Standards Committee.**—The number of representatives of the Institution on this Committee is to be increased to three, viz., Colonel R. E. Crompton, C.B., Messrs. J. F. C. Snell, and C. P. Sparks. In place of the existing Electrical Plant Committee an Electrical Sectional Committee is to be formed, representative of every electrical interest, and containing a predominating representation of the Institution.

**Scottish Local Section of the I.E.E.**—The annual report records eight meetings with an average attendance of 49. The membership of the section is 391, including 43 students. The following is the committee for next session:—*Chairman*, Mr. J. Lowson; *Vice-Chairman*, Mr. D. A. Starr; *Past-Chairmen*, Messrs. F. A. Newington, W. M'Whirter, and J. A. Robertson; *Chairman of Students' Section*, Mr. A. Page; *Ordinary Members of Committee*, Messrs. M. B. Field, J. H. Bunting, J. S. Nicholson, J. K. Stothert, J. F. Nielson, E. T. Goslin, G. Stevenson, W. L. Spence, J. E. Sayers, A. S. Hampton, and Prof. J. D. Cormack. *Hon. Secretary and Treasurer*, Mr. J. Taylor. *Assistant Honorary Secretary*, Mr. W. F. Mitchell. The annual summer outing this year will take the form of a steamer excursion to Arran on June 9th.

## THE BIRMINGHAM CONVENTION OF THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION

THE full programme of the forthcoming I.M.E.A. Convention at Birmingham on June 15th to 25th, under the Presidency of Mr. R. A. Chattock (City Electrical Engineer), has now been issued. The principal arrangements are as follows:—

**Monday, June 15th.**—The Convention Bureau will open at the Grand Hotel, and in the evening an informal reception and smoking concert will be given by the Birmingham Entertainments Committee.

**Tuesday, June 16th.**—Meeting at Midland Institute to hear Mr. Chattock's Presidential Address and a Paper by Mr. W. A. Vignoles (Grimsby) on Commercial Development of Electric Supply to Towns of Moderate Size. After a lunch provided by the Birmingham Entertainments Committee, visits will be paid to the Witton works of the General Electric Co., and the works of Belliss & Morcom. The Summer Lane electricity works of the Corporation will also be open to inspection. In the evening the annual dinner will be held at the Grand Hotel. Visits will be arranged for ladies to Elkington's show-rooms and works and the Birmingham Art Gallery.

**Wednesday, June 17th.**—Meeting at Coventry, at which Mr. S. E. Fedden (Sheffield) will read a Paper on boiler-house plant. Visits will be paid in the afternoon to the Daimler Co.'s works, and to the Coventry Corporation electricity works. The following works will also be open to inspection: Coventry Ordnance; Triumph Motor Cycle; Coventry Chain Co., and B.T.-H. Co.'s meter works. The B.T.-H. Co. and Willans & Robinson will also convey members who desire to see their works at Rugby and back to Coventry during the afternoon. A visit will be paid by the ladies to Combe Abbey in the morning, and to places of interest in Coventry in the afternoon. A reception and dance will be held by the Lord Mayor of Birmingham in the evening.

**Thursday, June 18th.**—Meeting at Stratford-on-Avon. Mr. J. H. Bowden (Poplar) will read a Paper on Standardisation of Tariffs. An excursion to Warwick will be made in the afternoon. An open air fête will be held at the Botanical Gardens, Edgbaston, in the evening, followed by a "Point Fives" meeting at 10.30 at the Grand Hotel.

**Friday, June 19th.**—Annual General Meeting in the morning. Visit to the Summer Lane Station in the afternoon.

**Saturday, June 20th.**—Visit to Worcester.

## ELECTRIC TRACTION NOTES

By twenty-five votes to twelve the Oxford City Council, at a special meeting last week, decided to agree with the National Electric Construction Co. for the latter to provide a service of motor-omnibuses instead of reconstructing the existing horse tramways for electric traction. The Company has a Bill in Parliament this session with this object in view, and the agreement with the Corporation provides that the latter shall forego the liquidated damages to which it is entitled by reason of the Company not having carried out the terms of previous Acts of Parliament. The existing horse-tramway track is to be handed over to the Corporation for the purpose of renewal. If, in the future, the Corporation requires a service of electric tramways, the Company is to promote the necessary Bill upon terms to be agreed, or failing agreement, to be settled by arbitration.

The Shanghai Electric Construction Co. is experimenting with two trolley-omnibuses with a view to possible extensions should this system of traction prove satisfactory.

The Ramsbottom U.D.C. has ordered two additional trolley-omnibuses, owing to the amount of traffic which the existing routes have attracted.

The Leeds Corporation Bill has been considered by a House of Lords Committee during the week. Among the objects is one to construct a trolley-omnibus system to Wharfedale, and it is in respect of this that the Yorkshire Electric Power Co. is opposing on the question of power. The argument is that, as these lines will be outside the Leeds Corporation area, the Corporation should not be allowed to supply, in view of the fact that they are in the area of the Yorkshire Electric Power Co. The Committee has passed the scheme on the understanding that so far as the trolley-

omnibus portion of it is concerned, a contribution of 0.375d. per car mile is to be paid by the Corporation towards the capital expenditure in widening or reconstructing the roads. The Corporation is to be at liberty to supply the electrical energy for the routes.

A new arrangement has been come to between the Mansfield Corporation and the Mansfield & District Light Railways Co., under which the latter will be supplied with electrical energy at 1½d. per unit for the first 400,000 units per annum, and 1d. per unit for all further supply, whether for traction, light, or any other purpose. The previous contract was at the rate of 1½d. for the first 200,000 units, 1½d. for the next 200,000 units, and 1d. afterwards.

It was stated at the annual meeting of the Lisbon Electric Tramways last week that, having come to an arrangement with the Lisbon municipality as to the interpretation of certain clauses in the Company's concessions, a new municipal body was elected before this arrangement could be ratified, and, unfortunately for the Company, the newly-elected Council will not endorse what its predecessors have done. The whole work of negotiation, therefore, has to be started over again.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

It is stated that wireless telephonic communication has been established between Nauen (Germany) and Pola (Austria), a distance of rather more than 580 miles. It is interesting to note that the Gross Glockner group of mountains is in the direct line between the two stations.

The Cefndu Transatlantic wireless station, near Carnarvon, which will be the largest transmitting station in the world, will be formally opened in a few weeks. It will communicate direct with a station close to New York. There are ten steel masts, each 400 ft. high, and the last row of masts is about 1,400 ft. above sea-level. The plant at this station will be controlled and operated from the receiving station at Towyn, Merionethshire.

A speed of 100 words a minute has been attained in wireless transmission between Chelmsford and Letterfrack, in Galway. Wireless stations are now being established at Stonehaven (Kincardineshire) and Newcastle-on-Tyne to supplement the existing overhead lines.

It is proposed to construct a new central exchange in Swansea in substitution for the two existing exchanges now working. The Telephone Department is spending some £200,000 on the telephone development of the district.

Private messages in code or cipher are again accepted for all offices in Mexico *via* Galveston, excepting Vera Cruz, in which case messages must be written in plain English, Spanish, or French. Either class of message is only accepted at sender's risk.—Telegraphic communication with Dawson, Yukon, is interrupted, and telegrams are forwarded by best means at sender's risk.

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☛ For the protection of Rubber Hose, Flexible Tubing, Cables, &c., &c.

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## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

### QUESTION No. 1,391.

If there is a rise in frequency in a system owing to speeding up of the generator, the watt-hour meters are caused to run slow. What is the explanation of this, and what is the relation between the change of frequency and the slowing down of the meters?

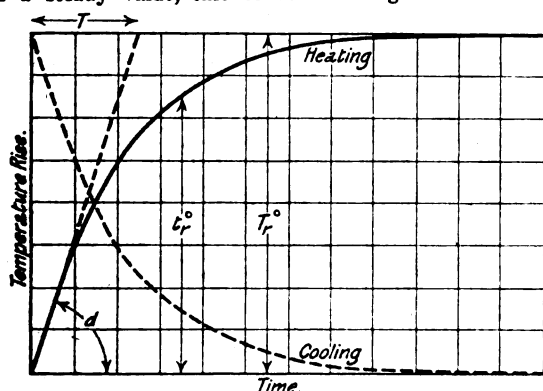
(Replies must be received not later than first post, May 28th.)

### ANSWERS TO No. 1,390.

What is the "heating time-constant" of a transformer? How can it be calculated from the design? Is it affected by alterations of load or the method of cooling?—J. H. B.

The first award (10s.) is made to "A. G. R." for the following reply:—

When a load is first applied to a transformer there will be very little heat radiated, so that the temperature rises quickly. As the heating proceeds the transformer begins to give out heat through convection, conduction, and radiation, with the result that the temperature increases at a less rate than before. For a given load the temperature will ultimately attain a steady value, this condition being reached when the



rate of generation of heat is equal to the rate of cooling. The steady temperature to which any part will rise depends on the losses, extent and nature of the cooling surfaces provided, and the facilities afforded for cooling. When the heated body is perfectly homogeneous and the cooling at its surfaces uniform, the curve of temperature rise is an exponential, the ultimate temperature being approached asymptotically.

If  $T_r^\circ$  = maximum or final temperature rise  $^\circ\text{C}$ .

$T_t^\circ$  = temperature rise at the end of any time  $t$  (sec.).

$e = 2.718$  = base of the Napierian logarithms.

$$T_t^\circ = T_r^\circ [1 - e^{-t/T}]$$

where  $T$  is the time constant of the equation, and is the time in which the total mass would reach the final temperature if there were no loss of heat by conduction, convection, and radiation. This latter condition is shown on the diagram by the tangent to the curve at the origin, and time taken to reach the final temperature would be  $T$ .

If  $\alpha$  = slope of this tangent to the time axis, then

$$\frac{T_r^\circ}{T} = \tan \alpha$$

Hence, at the commencement of heating the slope of the temperature curve is dependent only on the heat generated and the thermal capacity of the body. It follows from this latter equation, therefore, that

$$\frac{T}{T_r^\circ} = \frac{\text{Heat capacity of body}}{\text{Heat generated in body}}$$

and when a constant final temperature is reached, all the heating losses are dissipated, and the final temperature rise is

$$T_r^\circ = \frac{\text{Heat generated}}{\text{Cooling surface}} \times \text{a constant}$$

$$= \frac{K \times \text{Watts lost}}{\text{Cooling surface}} = \left[ \frac{KW}{A} \right]^\circ \text{Centigrade.}$$

where  $K$  is the temperature rise per watt per square foot if  $A$  = cooling surface in sq. feet.  
 $W$  = watts to be dissipated.

The following table gives the values of  $K$  for different methods of cooling, and these values may be taken as representative of modern practice.

Values of  $K$  = Temperature Rise per Watt per Square Foot.

Nature of cooling surface.	Oil-cooled.	Air-cooled.		
		Natural draught.	Air-blast 2.65 cubic feet per second per K.V.A.	Air-blast 5.3 cubic feet per second per K.V.A.
Coils { d.c.c. Round wire...	0.22	1.72	1.07	0.65
{ d.c.c. Square wire...	0.22	1.50	0.91	0.54
{ Bare strip .....	0.18	1.29	0.75	0.43
Iron edge surface .....	0.18	0.70	0.32	0.22
Oil to air through case ...	1.61	—	—	—
Oil to cooling water .....	0.25	—	—	—

If the load alters, the loss in watts dissipated will also alter, and thus temperature rise will change.

It may be pointed out that after a time  $4T$ , i.e.,  $4 \times$  time-constant, the temperature is within about 2 per cent. of its theoretical final value, and may therefore be regarded as constant.

The second award (5s.) is given to "W. C. G. H.," who writes as follows:—

The time constant of a transformer is a measure of the time in which the transformer would reach its final working temperature, if no heat was lost by radiation and conduction. It is therefore proportional to the heat capacity of the materials of which the transformer is constructed, and inversely proportional to the cooling surface. The constant is used in practice in the determination of the temperature rise of transformer after a working period less than that taken to attain maximum temperature, by formula

$$T_1 = T(1 - e^{-t/T})$$

where  $T_1$  = temperature rise after prescribed interval of working.

$T$  = Maximum temperature rise.

$e$  = Base of Napierian logarithms (2.7183).

$t$  = Time of working interval in seconds.

$k$  = Time constant of transformer.

In designing, the constant is obtained by dividing the joules required to raise the mean temperature of transformer  $1^\circ\text{C}$ . (a), by the watts lost by radiation, &c., of transformer for  $1^\circ\text{C}$ . rise above surroundings (d).

$$a = (\text{kilograms iron} \times h + \text{kg. copper} \times h_c) \times 1.3 \times 4.2 \times 1000.$$

$h$  and  $h_c$  are the values of specific heat for iron and copper (11 and .09 respectively).

1.3 = ratio mean internal to external temperature (approx.).

4.2 = ratio of calories to joules.

1000 gives results for kilograms.

$d$  is obtained by dividing the effective cooling surface (which consists of the area of windings exposed to the cooling medium, + edges only of core iron) by a constant  $C$  depending on the cooling system and thickness of insulation on windings. Designing constants should be obtained experimentally for special cooling systems, but following table gives approximate values. Cooling surface in square decimetres.

Natural draught (perforated case)—14.

Air blast (average draught)—8.

Oil filled—2.

The latter constant is very low and can only be reached when the cooling oil is itself cooled by water circulating through it. Without the latter the radiation of heat from the oil tank must be similarly calculated.

With specially high voltages constants are slightly higher owing to the bad heat conduction of the insulation.

The above shows that the time constant decreases as methods of cooling improve. Changes of load do not affect it, the transformer reaching its maximum temperature for any constant proportion of its full load, in the same time as taken to attain full load maximum temperature on full load, the resultant final temperature alone varying with the load.



# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published May 14th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in *italics* indicate communicators of inventions from abroad.

4,071/13. **Automatic Telephone System.** D. S. HULFISH. This specification describes a method by which one conductor can be used, both for the operation of the clutch of a distant switch, and as a test conductor for determining whether the distant switch is in normal position or not. Provision is also made whereby, in the case where similar circuits having a common destination are used, these duplicated units are used in rotation so that if one call fails owing to a fault in one particular circuit, on repetition of the call, the next unit of apparatus is utilised. The latter is accomplished by causing each unit to test "busy" after it has been used for a call, so that the following call is sent through the next unit. When the last unit of the group has been used, this "false busy" condition is removed from all the circuits, which may then be made use of again. Seventeen figures.

6,911/13. **Manufacture of Tungsten.** O. VOIGTLÄNDER. A mixture consisting of 60 per cent. tungsten tri-oxide and 40 per cent. aluminium is placed in a crucible and burnt in a strongly heated furnace. A current of inert gas is passed through the crucible during the process. Pure, homogeneous tungsten is obtained.

29,203/13. **Ventilation of A.C. Motors.** SIEMENS BROS. and E. O. KIEFFER. Air for rotor cooling is drawn through axial ducts by a fan in usual manner, and issues out through a vent pipe immediately. Air for stator cooling is drawn in by another fan and enters the machine at the end at which the rotor-cooling air leaves it. The two streams of air flowing in opposite directions keep the machine at nearly equal temperatures throughout its length. Two figures.

2,850/14. **Electrolytic Meter.** B.T.-H. (*G.E. Co., U.S.A.*). The anode of mercury is contained in the upper part of the glass body of the meter, and rests on a diaphragm of goldbeater's skin. The cathode is of platinum, and is situated beneath the diaphragm. The deposited mercury falls to the bottom of the meter, which is in the form of a graduated tube. Two figures.

## Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** HUGHES [Raising mechanism] 10,188/13; DEUTSCHE GASLUHLICHT AKT.-GES. [Vapour lamps] 15,046/13.

**Distributing Systems, Cables and Wires, &c.:** A.E.G. [Automatic phase regulator] 10,609/13; B.T.-H. (*G.E. Co., U.S.A.*) [Distribution systems for vapour lamps] 19,022/13.

**Dynamos, Motors, and Transformers:** ROLFE [Dynamo excitation] 24,898/12; THOMAS & THOMAS TRANSMISSION, LTD. [Dynamo for accumulator charging] 7,252/13; SIEMENS SCHUCKERTWERKE GES. [A.C. commutator motors] 11,313/13; WEISS [Oil transformers] 24,162/13; SIEMENS BROS. (*Siemens Schuckertwerke Ges.*) [Rectifier] 29,763/13.

**Electrometallurgy and Electrochemistry:** ROCKEY and ELDRIDGE [Copper refining] 7,409/13; SOC. GEN. DES NITRURES [Manufacture of aluminium nitride] 23,740/13.

**Heating and Cooking:** BROADBENT and DAVIES [Heating process] 9,105/13; RAILING and KRAUSE [Soldering iron] 10,500/13; LACASSE [Radiators] 16,485/13; MADSEN [Toaster] 24,419/13.

**Ignition:** HILL (*Apparate-Bauanstalt Fischer Ges.*) [Magnetoe apparatus] 21,509/13.

**Incandescent Lamps:** TAYLOR and WILLIS [Anti-vibrators] 23,388/13; LOEWENSTEIN [Lamps] 2,843/14.

**Instruments and Meters:** CARDEN [High-frequency apparatus] 15,283/13; MELLERSH-JACKSON (*Packard*) [Thermometers] 23,720/13.

**Storage Batteries:** LEITNER [Charging apparatus] 12,639/13; PORDES [Packing enclosure for battery cells] 106/14.

**Switchgear, Fuses, and Fittings:** SCOTT and DEATS [Contacts] 2,169/13; MANSELL [Regulating device] 9,447/13; BLOXAM (*R. Bosch*) [Automatic regulator] 9,959/13; COUSANS [Motor controller] 10,770/13; HODGSON [Distant control switches] 15,642/13; DONOVAN [Fuses] 23,035/13; CHAPMAN and KENNEY [Connection plugs] 25,675/13; LEACH and JOEL [Switch springs] 26,150/13.

**Telephony and Telegraphy:** KATZ [Automatic telephony] 2,302/13; HAUXWELL [Engine-room telegraph] 18,138/13; JUDG, DAVIES, and EASTERN TELEGRAPH CO. [Telegraphy] 5,037/14, 5,831/13; POLLAK [Interrupters] 5,070/14.

**Traction:** NORTON [Tail lights] 16,084/13; DELMEZ [Mounting of tram motors] 17,005/13.

**Miscellaneous:** WATKINS [Electric horn] 10,190/13; BAKER and McKECHNIE [Relays] 11,751/13; FRIED. KRUPP AKT. GES. GRUSONWERK [Separators] 24,355/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** SIEMENS SCHUCKERTWERKE GES., 9,960/14.

**Dynamos, Motors, and Transformers:** SOC. ANON. DES AUTOMOBILES DELAUNAY-BELLEVILLE [Dynamo and motor control] 2,437/14; MASCHINENFABRIK OERLIKON [Safety device for motors] 9,542/14.

**Electrometallurgy and Chemistry:** GES. FÜR ELEKTRO OSMOSE [Colloidal process] 10,083/14.

**Incandescent Lamps:** VERON [Pocket lamp] 9,768/14; SEIFERT [Manufacture of tungsten wire] 9,772/14; HELLER [Lamps] 10,387/14.

**Instruments and Meters:** GRISSON [Instrument for measuring Röntgen rays] 8,146/14.

**Telegraphy and Telephony:** AKT.-GES. ELEKTRISK BUREAU [Automatic telephone systems] 9,822/14; BETULANDER [Automatic and semi-automatic telephone systems] 9,840/14.

The following Amended Specifications may now be obtained:—

**Incandescent Lamps:** WOLFRAM LAMPEN AKT.-GES. [Filament supports] 12,753/13.

## Restoration of Lapsed Patents

15,544/09, Electrically-controlled crane brakes, 15,681/09, Improved switches, and 15,682/09, Collecting brushes. Orders have been made restoring these Patents to BERTRAM THOMAS and EUSTACE THOMAS on the 6th day of May, 1914.

## Opposition to Grant of Patent

6,900/13. **Safety device for D.C. instruments.** H. DORMER. Opposition to grant of this Patent has been entered.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

9,331 of May 21st, 1900. **Electrolytic Bleaching.** M. HAAS. A method of ensuring constant circulation of electrolyte used in the production of bleaching liquor. The electrolysis chamber is divided into a number of compartments with inlet holes at the bottom. This chamber is supported in a larger vessel, which is filled with electrolyte. When electrolysis begins, the hydrogen evolved rises to the surface, and so causes an upward current in each compartment. Fresh liquor enters at the bottom to replace that which overflows into the storage vessel.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** C. O. BASTIAN and A. E. SALISBURY [Mercury vapour lamp] 1,995/03; M. VON RECKLINGHAUSEN [Mercury vapour lamp] 2,495/04.

**Distributing Systems, Insulating Materials, &c.:** B.T.-H. (*G.E. Co., U.S.A.*) [Insulating material] 2,127/09, 2,128/09.

**Electrochemistry and Electrometallurgy:** HALL [Production of pure alumina from bauxite by a two-stage smelting process] 2,260/02.

**Heating and Cooking:** W. OTTO [Heating resistance for air baths] 1,922/09.

**Ignition:** O. J. and A. M. LODGE [Ignition apparatus in which the spark gap is connected with a condenser circuit] 2,162/03.

**Instruments and Meters:** J. FERGUSON and KELVIN & JAMES WHITE [Clock mechanism for recording instruments] 2,353/02.

**Storage Batteries:** H. F. JOEL [Method of ensuring circulation of electrolyte] 2,652/07.

**Telephony and Telegraphy:** A. W. SHARMAN [System of leakage telephony] 2,169/09.

**Traction:** PFATISCHER [Motor-driven vehicles fitted with rotary transformers] 2,329/06.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 288. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**DRY BATTERIES.**—A revised edition of a catalogue of "Blue Bell" dry cells for telephone and bell purposes is to hand from the Western Electric Co., Ltd. (North Woolwich). Leclanché and other wet cells are also dealt with to a certain extent. Any of our readers will be supplied with a copy on request.

**SWITCHES AND WALL PLUGS.**—A leaflet from A. Reyrolle & Co., Ltd., gives notice of reductions in prices of quick make and break oil switches, and reductions in prices of glands used in connection with the Reyrolle standard earthed plugs and sockets are announced in another new illustrated pamphlet.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**THE E.C. JOURNAL.**—The latest issue of this little magazine of the Electrical Co. contains some interesting details of the factory wherein the high-tension apparatus sold by them is made. There were also some views of the A.E.G. cable works, some particulars of illumination material, recording instruments, and other specialities, and a list of dynamos and motors in stock.

**ELECTRIC COOKING.**—A neat little folder is being issued by the Westminster Electric Supply Corporation, entitled, "Some Electric Kitchens, and what the Cooks think of Electric Cooking." Over twenty photographs of actual cooking installations are reproduced, and the opinions quoted indicate very satisfactory experience.

**MEASURING INSTRUMENTS.**—We have received from J. H. Holmes & Co. (Newcastle-on-Tyne) a pamphlet describing their various types of ammeters and voltmeters, the "Castle" portable testing set, and a combined form of galvanometer and battery.

**ELECTRIC LIGHTING AND COOKING.**—We have received copies of several new publications which are being issued by the Electric Supply Publicity Committee. An attractive new design has been prepared for an electric cooking poster showing a very up-to-date young lady examining the progress of the cooking of some appetising dish. This is also reproduced as a post-card. Another item is a reprint of a lecture by Mr. F. S. Grogan on "The Cooking Problem: Why Electricity is Winning." Two leaflets addressed to industrial consumers call attention to the advantages of electricity in the laundry and hairdressing business, and a coloured folder sings the praises of the electric iron for domestic purposes.

### NEW INSTALLATION ACCESSORIES

**A** MONG several new accessories just added to the permanent lines carried by the General Electric Co., Ltd. 67 Queen Victoria Street, E.C.), is the neat pattern of suspension switch for through wiring, shown in Figs. 1 and 2. This should prove exceedingly convenient where flexible wire is used, and it is desired to have a means of controlling a circuit close to the apparatus itself other than the ordinary key switch holder. This switch is only 2½ in. long and

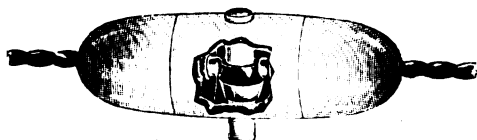


FIG. 1.—SUSPENSION SWITCH ARRANGED FOR THROUGH WIRING.

2½ in. in diameter. The terminals are arranged conveniently at each end, an efficient cord grip is provided, and the body is usually composed of best non-inflammable imitation ivory; by short-circuiting the lower terminals with a piece of copper wire, it can be used as an ordinary suspension switch. Other novelties are combined switches and wall plugs, with the firm's well-known "Slick" tumbler movement, a "Slick" two-way flush switch and the special type of bayonet lamp-holder for use with signs, radiators, &c., shown in Fig. 3.

The difficulties of wiring in these positions are lightened by its use, as the back of the lamp-holder is quite open. A substantial backplate lamp-holder known as the "Excel" has also been introduced, having a deep recess at the back

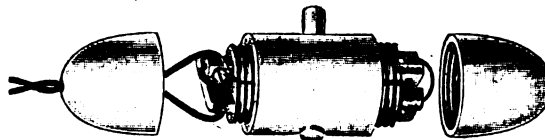


FIG. 2.—SUSPENSION SWITCH WITH ONE PAIR OF TERMINALS SHORT-CIRCUITED.

for the wires. The Company have also brought out some new patterns of externally-insulated lamp-holders, so as to prevent the most careless of workmen from accidentally receiving a shock. Instead, however, of the insulation being of china,

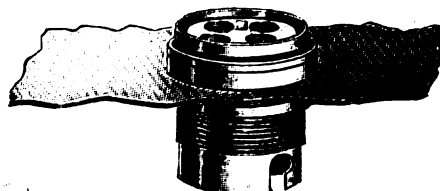


FIG. 3.—LAMP-HOLDER FOR SIGNS, RADIATORS, &c.

buyers now have the option of purchasing these lamp-holders from the General Electric Co., Ltd., fitted, to comply with the Home Office requirements, with outer cases of a special grade of insulating and fireproof composition.

### ARC-LAMP LOWERING GEAR

**A** NEW pattern of arc-lamp contact suspension apparatus has been brought out by the London Electric Firm (George Street, Croydon). In order to give the requisite high degree of insulation both the body and plug are mounted



FIG. 1.—HIGH-TENSION LAMP SUSPENSION APPARATUS.



FIG. 2.—WIRE-ROPE PROTECTOR.

on special corrugated porcelain insulators. The suspension feature is the well-known and tried one, embodying two ratchets in circular form, one superimposed above the other

and set at an angle from it. Every alternate tooth in the lower ratchet is cut away first to allow the pins to enter and trap the plug, the second cycle releasing them and allowing it to pass out. To engage the gear, the winch line is drawn up, and the pins, or horns, on the plunger engage with the ratchet and travel up the inclined face of the upper half until it can be drawn no further, then the winch is slightly reversed, when gravity brings the pins straight down, where it is trapped in the ratchet. To lower, the winch line is hauled again until the pin reaches a dead stop, and a second reversal of the winch lowers the plug with its lamp clear to the ground for trimming. By the use of this device the wire rope is only used for hauling and lowering the lamp, and not for suspending it, and there are no levers or other such contrivances liable to require adjusting. In addition to their well-known self-sustaining winch, the Company has evolved a quicker operating pattern to meet the modern high-speed conditions of trimming 80/100 lamps per day, which practically fulfils the condition of "dropping the lamp," and at the same time possesses the valuable feature of self-sustaining both in raising and lowering, without ratchets, pawls, springs, brakes, or triggers, and assures the safety of the lamp under all conditions whether the handle slips or breaks, or the winch becomes otherwise interrupted in operation. Fig. 2 shows an improved wire rope protector. This is sufficiently flexible to go round the swan neck or other restricted part of an arc-lamp column, and effectually overcomes the old trouble of chafed cables inside the lamp pillar, as the rope works in what is practically a closed conduit throughout its length.

### A TELEPHONE CATALOGUE

A FINE new catalogue of telephone apparatus has been produced by the Western Electric Co., Ltd. (North Woolwich, E.), covering an enormous range of telephone material, from the little domestic set for bell circuits and direct-acting sets for short lines to the latest refinements of automatic exchange equipment, and including many new up-



FIG. 1.—ALL-METAL  
C.B. WALL SET.

FIG. 2.—NEW C.B. DESK SET.

to-date designs. Many patterns of central battery interphones are listed. Among the series of wall sets we notice a number of patterns which have been specially designed for tropical use where protection from ants is desirable. These, as well as other sets, are fitted with the "capsule" closed type of transmitter. Mining telephones are well represented, as well as special instruments for tramway, police and military. A new design of all-metal C.B. wall set is shown in Fig. 1, and a new C.B. desk set in Fig. 2. It will be noticed that

a hand combination set is used in the latter, and that instead of a switch hook being provided, the switch is inside the handle of the instrument, and is actuated by the suspension ring. A great number of cordless and other private branch exchange boards are included; one of the latter is illustrated in Fig. 3. Interesting illustrations are given in the list of exchange manual switchboards, clerks' desks, &c., of various patterns, and other items of exchange equipment, and the section on accessories dealing with batteries, bells, cables, terminals, fuses, heat coils, magnetos, jacks, &c., contains

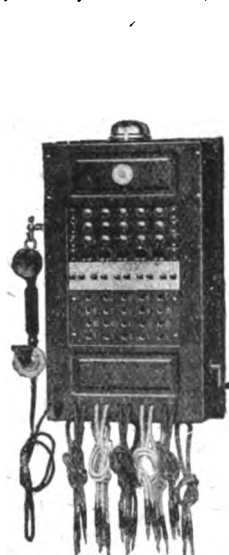


FIG. 3.—PRIVATE EXCHANGE  
BOARD.



FIG. 4.—LOADING COIL.

items too numerous to particularise. We may notice, however, in the cable section, the special multiple interphone cables with enamelled wire conductors. Among the receivers are some new patterns for wireless work, and a new "watch" receiver, carefully balanced so that it hangs quite straight. Repeating and retardation coils are now regularly listed, and testing sets and tools occupy several pages, and a comprehensive section is devoted to telephone line material. Some notes on the Western Electric machine switching system for exchanges are included in an appendix, and among miscellaneous illustrations at the end are some fine three-colour representations of the London-Birmingham trunk telephone cable specially constructed for put-in loading coils and phantom circuit working, and an 800-pair subscribers' dry-core paper-insulated cable. Views are also reproduced of the laying of the London-Birmingham and other cables; and Fig. 4 shows the standardised form now taken by loading coils used in conjunction with long lines.

### CHURCH LIGHTING

SPECIAL problems are presented in the lighting of ecclesiastical buildings, and of late increasing attention has



ELECTRIC LIGHTING AT ST. ANNE'S CHURCH, LIVERPOOL.

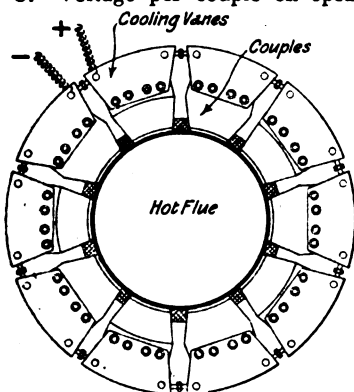
been paid to the subject, with the result that fine examples of church lighting are now in existence, which form a great

contrast to the crude and insufficient arrangements that formerly sufficed.

An excellent example which has been sent us by the British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.) is the lighting of St. Anne's Church, Liverpool; an interior view of which, taken by the light of the ordinary installation, is reproduced here. Concealed lighting is employed, and the illumination is obtained from Mazda lamps in "Mirolux" silvered glass trough reflectors attached vertically to the east side of each of the wooden beams which support the groined roof. These beams extend down the wall about 10 ft. beyond the end of the roof arches, and a battery of three Mirolux reflectors is fixed near the lower end of each beam. The reflectors are disposed at such an angle as to throw the light outwards and forwards into the body of the church, in the direction of the altar. The lighting units are only visible to people who turn round in their seats and deliberately look up at them. Looking towards the altar, on which every reflector is trained, it is impossible to see the units at all. The resulting illumination forms an extraordinary contrast with the old gas lighting, which was from lamps fixed to the pillars, about 8 or 9 ft. from the ground. In this position they created an enormous amount of glare, but the illumination on the pews was quite inadequate. The new lighting was designed to illuminate the *whole* of the interior adequately but glarelessly. The altar is lighted in the same way as the main church, and its illumination is helped considerably by the general lighting, since all the batteries of reflectors are directed towards it. As a result the altar is more intensely lighted than the rest of the church, and is thus given appropriate emphasis.

### A NEW THERMOPILE

SOME interest has been aroused lately by the claims which have been put forward regarding the merits of a new form of thermopile which is now being manufactured by The Walker Shaw Syndicate (28 St. James's Square, S.W.). We were present at a demonstration which was given on Friday last at the offices of the syndicate. The complete thermopile is intended to be built in the form of a horizontal flue, with the hot junctions of the thermo-couples arranged around the inner circumference, so that they are heated by the hot gases which pass through. The cold junctions will form the outside of the flue, and will be cooled by a current of air. A small segment of one of these flues, consisting of ten couples arranged for either series or parallel working, was used for the tests. The "hot junctions" of the couples were capped with electrolytically deposited copper, and, in the present instances, were heated by gas jets. A small thermo-couple and milli-voltmeter were used for taking temperatures of the junctions. The following readings were obtained: Temp. of hot junctions,  $375^{\circ}\text{C}$ .; temp. of cold junctions,  $75^{\circ}\text{C}$ . Voltage per couple on open-circuit, 0.063



SECTION THROUGH THERMO-COLUMN.

volts. The ten couples were joined in parallel, and the circuit closed through a high resistance wire and a shunt ammeter. The current indicated was 40 amperes, whilst at the same time the voltmeter reading was 0.035 volts, giving a total power of 1.4 watts for the ten couples. By using the required number of couples, any desired power can be obtained, providing that sufficient space is available. Judging from the drawings of a 30-watt "thermo-column" which has been constructed, the size of a 1-kw. set would need to be about 2 ft. 6 in. outside diam. by 1 ft. 6 in. inside diam. by 22 ft. long. It will be seen from this that a generating set made up of these thermo-columns would occupy considerably more space than any other type of plant at present used. On the other hand, the running expenses would be greatly reduced, providing that the couples maintain their efficiency under

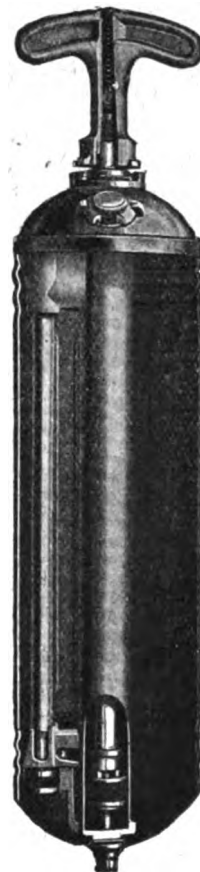
working conditions. The makers claim to have ensured this by the special construction of the couples. The negative element consists of constantan, a nickel-copper alloy, and the positive is of "Golma" alloy. The junction between the two is made by electrolytically depositing a thick coating of copper over both metals. This ensures a perfect and permanent connection.

### PYRENE FIRE EXTINGUISHERS

WE were allowed, by the courtesy of the Western Electric Co., Ltd. (Norfolk House, London), to witness some interesting tests with "Pyrene" extinguishers last week. These tests, which were conducted on the Aldwych site, demonstrated very clearly the remarkable fire-extinguishing properties of "Pyrene." In all, fourteen different tests were made, in which burning petrol, acetylene, celluloid, carbon-bisulphide, wood-wool and cotton-waste soaked in petrol, coal-tar and petrol, were allowed to become thoroughly ignited, and in every case the flames were effectually and promptly quenched. To give an idea of the time required to extinguish the flames, the following examples may be cited:—A tank 18 in. by 15 in. by 18 in. deep was supported about 4 in. above the ground on bricks, and 2 gallons of petrol were poured in. A tap was then opened in the bottom of the tank, and the petrol was ignited both in the tank and on the ground beneath it. After the petrol had burned for thirty seconds, a jet of "Pyrene" was directed on to the flames, which were subdued in forty-eight and a-half seconds. Shortly after this, half a gallon of carbon bisulphide was poured into a bucket, ignited, and allowed to burn for ten seconds. The resulting conflagration was extinguished in the space of two and a-half seconds.

The "Pyrene," which is a colourless, mobile liquid, is squirted on to the burning materials, when it immediately vaporises and forms a dense white blanket, which smothers the flames by preventing access of air. By way of showing the harmlessness of this liquid, it was sprayed over one of the assistants. After a few minutes, it had completely evaporated, without leaving any trace.

We also received particulars of some previous tests which had been conducted at the St. Marylebone Generating Station. In addition to the tests mentioned above, one of the turbo-generators was connected through a liquid resistance to two steel rails butted together, and an arc was formed by drawing one of the rails away from the other. It was found that an arc of 700 amperes at 480 volts was easily extinguished. Another test showed that "Pyrene" has no harmful effect when played upon the commutator and brushes of a machine, even when the latter is running at its full voltage. The extinguisher, which is illustrated above, is easily manipulated by one man, the standard size being 3 in. diameter by 14 in. long, and weighing 5 lb. when filled with "Pyrene" liquid. We understand that the Western Electric Co., Ltd., are sole agents to the electrical trade.



Sectional View.  
PYRENE FIRE  
EXTINGUISHER.

**Trolley Wire Splicing Sleeves.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), has added to its catalogue of traction supplies, prices and description of "Acme" splicing sleeves for splicing trolley wires. With these sleeves a very efficient joint can be made with a minimum expenditure of time and labour. The two ends of the wires to be joined are drawn through the two halves of the sleeve, which is made in best gunmetal and heavily tinned, and the projecting ends of the wire are flattened for a short distance, then by means of a central screw, the two halves of the sleeve are brought together. Holes are provided for filling in with solder if thought desirable.

**Cinematograph Carbons.**—The General Electric Co. inform us that their make of "Kinarco" carbons, which are the only cinematograph carbons of British manufacture, were used on the occasion of Mr. H. G. Ponting's special demonstration of his well-known films taken on the Scott Antarctic expedition at Buckingham Palace before the King and Queen of Denmark.



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Bedford.**—Steam and other pipework for generating station. Borough Electrical Engineer. May 28th.

**Belgium.**—Tenders are invited by May 28th for the electric lighting of three sheds at the Canal Dock. Tenders to Burgomaster, Hotel-de-Ville, Antwerp. A copy of the specification may be seen at 73 Basinghall Street, E.C.

**Brierfield.**—The offer of the Nelson Corporation to supply electricity in bulk on a seven years' agreement at 2d. per unit for lighting and 1½d. for power, has been accepted.

**Bury.**—A Local Government Board inquiry was held last week concerning a loan of £62,502 for works and mains extensions. This large expenditure is necessitated mainly by the arrangement to supply the Heywood Corporation and Radcliffe Council with electricity in bulk.

**Cleckheaton.**—2,000 yds. 0.5 concentric cable, and 2,000 yds. three-core pilot cable. Town Clerk. May 23rd.

**Darlington.**—Water-tube boiler and cooling tower for Electricity Department. Town Clerk. June 4th.

**Dundalk.**—An inquiry has been held concerning a loan of £20,000 for extensions to the electrical undertaking, with a view to supplying the Great Northern Railway Co.'s locomotive works. An agreement has been entered into for the supply of 480,000 units at nine-tenths of a penny, and all excess over that amount at seven-tenths of a penny per unit. The minimum yearly bill to be £1,800. There was opposition on the part of the Dundalk Gas Co. on the ground that the scheme was unsound, the argument being put forward that the Belfast Corporation could not supply current for their trams at which the Council were offering to supply the Railway Co. in this case.

**Ellon.**—The Council has finally agreed with Messrs. T. C. Smith & Co. with regard to an electric lighting installation.

**Ireland.**—The Loughrea Electric Power & Lighting Co. invite tenders for a power station consisting of gas engine and suction plant, dynamo, battery, switchboard, overhead lines, and street lamps. Consulting Engineer, L. J. Lawless, 27 Castlewood Avenue, Rathmines, Dublin.

**Leeds.**—Motor-driven induced-draught plant for dealing with 230,000 cub. ft. of gas per min. Manager, Electricity Department. June 10th.

**Leigh (Lancs.).**—An inquiry was held last week concerning a loan of £10,225 for electrical extensions.

**London: Hampstead.**—Tenders are invited for one 1,500-kw. turbo-alternator, condenser, pipework, cooling tower, and tank, by June 11th. (See advertisement.)

**Hackney.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £15,750 for electrical purposes.

**Stepney.**—Three years' supply of ampere-hour meters, demand indicators, and time switches, and one year's supply of arc-lamp carbons. General Manager, June 11th. (See advertisement on another page.)—The Finance Committee of the L.C.C. recommends sanction to a loan of £15,000 for mains.

**Woolwich.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £542 for a sub-station site and spare armature.

**Lurgan.**—The Board of Trade has granted the Council a provisional order.

**Oldham.**—Two 3,000-kw steam turbines, water-tube boilers, feed pump, cooling towers, &c. Borough Electrical Engineer.

**Shanghai.**—H.T. three-phase switchgear for sub-station. Consulting Engineers, Preece, Cardew & Snell, 8 Queen Anne's Gate, Westminster, S.W. May 28th.

**Stockport.**—A loan of £17,650 for electrical extensions is being inquired into.

**Swinton.**—The question of converting the present system to three-phase supply is under consideration. An application is to be made to the Local Government Board for a loan of £1,500 for general extensions.

**Watford.**—A Local Government Board inquiry was held last week concerning a loan of £15,150 for extensions into a number of outlying districts, which were authorised by an Act of Parliament last year.

**Wellington (N.Z.).**—Oil break switches are required in connection with the Lake Coleridge power scheme. Tenders by June 1st. A copy of the specification may be seen at 73 Basinghall Street, E.C., but the time is too short to tender, except for those firms who can instruct their agents in Australia by cable.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Birmingham.**—Rebuilding of Northfield public library. City Engineer, Town Hall.—Extension of parcel office, H.M. Office of Works, London.

**Chorley.**—New council offices.

**Coventry.**—Municipal technical institute.

**Dundee.**—Conversion of school building into town hall. Architects, Messrs. Haxton & Walker, Leven.

**Lancaster.**—Cinematograph theatre. Lancaster Palladium, Ltd.

**London.**—New baths, washhouses, and public library are under consideration by the Deptford Council.

**Middleton.**—New mill. Soudan & Co.

**Nelson.**—Rebuilding of Bankfield Mills after fire.

**Rotherham.**—Shops, offices, and arcade in Main Street. Architect, J. Platts, High Street.

**Sal.**—New school. Architects, Hoy & Sisley, 199 Deansgate, Manchester.

**Southampton.**—New library at Portswood.

**Swansea.**—New school in Middle Row. Clerk, Education Offices, 9 Grove Place.

### Miscellaneous

**Clyde Navigation.**—The Trustees of the Clyde Navigation require a twelve months' supply of electrical stores. General Manager, 16 Robertson Street, Glasgow.

**London: H.M. Office of Works.**—Three years' supply of lift ropes. (See advertisement on another page.)

**Metropolitan Police.**—Tenders are invited for the supply and maintenance of electrical cell calls at police stations and police courts for three years. Receiver, New Scotland Yard. June 3rd. (See advertisement on another page.)

**Port of London Authority.**—Twelve new electric cranes are required for the Tilbury Dock extension, and the installation of electric accumulators has been authorised at a cost not exceeding £5,500.

**Montreal.**—A Montreal merchant is desirous of doing business with makers of electrical and hardware specialities. His name and address may be obtained from the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, E.C.

## TENDERS RECEIVED AND ACCEPTED

**Bedford.**—A contract has been placed with the B.T.H. Co. for a twelve months' supply of type R.H. A.C. meters.

**Bootle.**—A contract for two 500-600-kw. rotary converters has been placed with the B.T.H. Co.

**Edinburgh.**—An order has been placed with Messrs. Chamberlain & Hookham for a twelve months' supply of D.C. meters.

**Kirkcaldy.**—An order has been placed with Messrs. Chamberlain & Hookham for a twelve months' supply of D.C. meters.

**London: G.P.O.**—A contract has been placed with the Edison & Swan United Electric Light Co. for a supply of Royal Ediswan drawn-wire lamps.

**Newcastle-on-Tyne.**—The Trainways Committee has ordered forty Angold magazine flame arc lamps from the G.E.C.

**Sunderland.**—The Corporation has ordered twenty-three Angold magazine flame arc lamps from the G.E.C.—A contract for a twelve months' supply of lamp-holders has been placed with J. H. Tucker & Co.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £65 5s. to £65 15s. (Last week the same.)

**The B.E.A.M.A.**—The Union Electric Co., Ltd. (Park St., S.E.), has decided to resign its membership of the British Electrical and Allied Manufacturers' Association, and accordingly has so notified the Secretary of the Association.

## LOCAL NOTES

**Carlisle:** *Minimum Charge for Lighting Consumers.*—The Electric Lighting Committee has fixed a minimum charge of 30s. per annum for lighting consumers. This action has been decided upon in order to avoid the loss on a number of small consumers who only use a few shillingworths of current during the year.

**Edinburgh:** *Charge for Public Lighting.*—The Gas Committee recently offered to carry out the public lighting with high-pressure gas at £7 per lamp per annum, compared with £9 per lamp per annum charged by the Electric Lighting Committee. Apparently as a consequence of this, the Electric Lighting Committee has requested the Electrical Engineer to report generally on the cost of lighting by electricity all the streets in the city at present not lighted by that means, and also as to the question of the existing price.

**Glasgow:** *Control of Electricity and Tramway Undertakings.*—The question of whether the management of the electricity and tramways undertakings should be placed in the hands of one committee has been discussed, but at a joint meeting of the Electricity and Tramways Committees last week it was agreed that the Pinkston tramway power station should be left, as now, under the control of the Tramways Department, provided that each department can get, by means of the interconnecting cables, whatever supply of energy can be spared from the Pinkston station and the Port Dundas lighting station respectively, should such assistance be required by either of the departments.

**Greenock:** *Starting-up of New Generating Station.*—The new 5,000-kw. Westinghouse-Rateau steam turbo-alternator set was started up last week. This is required in connection with the supply to Port Glasgow.

**Hove:** *Management of Council's Electricity Undertaking.*—In answer to a question in the Council last week, the Chairman of the Electric Light Joint Committee stated that, after considering various offers to lease the electricity undertaking, and rejecting most of them, the Sub-committee appointed for the purpose submitted two, together with the offer of the Brighton Corporation to supply in bulk, to Mr. C. B. Smith, the Hove Electrical Engineer, who was also asked to report as to the desirability of the Corporation retaining the management of the late Company's undertaking in its own hands. After this report had been received, two later offers to lease the undertaking had been received, and the Corporation was awaiting further details of these.

**London:** *Agreements under Electric Supply Act, 1908.*—An arrangement has been come to between the Stepney and Shoreditch Councils for a temporary bulk supply by the former to the latter under Section 3 of the London Electric Supply Act, 1908, for a period of one year, with an extension for a further year at the option of Shoreditch. The energy to be supplied is to be E.H.T. three-phase A.C., at a minimum of 6,000 volts, 50 periods. The Highways Committee of the L.C.C. recommends sanction to the agreement on the ground that it will obviate the extension of a small generating station. Attention is drawn to the fact that under Clause 13 any dispute as to the accuracy of the meters measuring the supply, is to be settled by the Board of Trade, but the Committee recommends that in this case any such dispute should be referred to the Council, and not to the Board of Trade.

**Marylebone:** *Presentation of Electric Vehicle Chassis.*—The Electric Supply Committee has had under consideration the purchase of a 10-cwt. electric vehicle for departmental purposes, but Councillor Duncan Watson has now presented the Department with a chassis capable of carrying a load of 30 cwt., and an expenditure of £80 is to be incurred in fitting the necessary battery, tyres, &c.

**Maidstone:** *The Value of Conferences.*—Discussing the desirability of sending Mr. E. E. Hoadley, the Borough Electrical Engineer, to the I.M.E.A. Conference in June, one of the members of the Electric Lighting Committee last week said that the attendance of Mr. Hoadley at various conferences during the year was worth anything from £50 to £100 to the undertaking, and in some cases even £500 per annum. It was agreed that Mr. Hoadley should attend as usual.

**New Reciprocating Engine Set.**—A new Belliss & Morecom E.C.C. reciprocating engine generating set, which has been installed at a cost of some £6,200, was put into operation last week. At the opening ceremony, Mr. E. E. Hoadley, the Borough Electrical Engineer, referred to the increasing demands for electricity for cooking and heating

purposes, and anticipated an enormous increase if only the Corporation had powers to let on hire or hire-purchase the necessary apparatus. If the municipal boroughs in London could be allowed these powers he failed to see why all municipal authorities outside London should not have similar powers.

**Rotherham:** *Power Load Doubled.*—The annual report of Mr. E. Cross, Borough Electrical Engineer and Tramways Manager, states that although the average cost of coal had increased from 81'9d. to 104d. per ton, the generating costs had decreased from '757d. to '651d. There was an increase of units sold as follows: Tramways, 18'14 per cent.; power, 53'96 per cent.; and lighting, 7'92 per cent. The average price obtained for current was 1'296d., as against 1'416d. last year, and the net profit was increased from £5,179 to £7,358. He recommended that the price of power for the tramways be reduced from 1½d. to 1¼d. per unit.

## APPOINTMENTS AND PERSONAL NOTES

Mr. W. L. Magden has been appointed representative of the London Chamber of Commerce to give evidence before the Royal Commission on Railways.

The Birmingham Electric Supply Committee have appointed Mr. E. A. Mills (North Metropolitan Electric Power Supply Co.) to the post of Assistant Constructional Engineer to the Electric Supply Department, at a commencing salary of £250 per annum, rising to £300. There were 194 applications.

The Stockport Electricity Committee has decided that a Chief Assistant Engineer is necessary in the interest of the undertaking, and recommends that Mr. R. H. Lee, at present Resident Engineer, be appointed to this position, at a commencing salary of £200 per annum.

The following appointments have been made to fill vacancies on the staff of the Nelson Electricity Department:—Mains Superintendent, W. D. Chalmers; Assistant Station Superintendent, H. Whittaker; Shift Engineer, John Crabtree.

The salary of Mr. C. Bexon, Electrical Engineer to the Kilmarnock Corporation, has been increased by £100 per annum.

A switchboard attendant is required in the Blackburn Electricity Department for E.H.T. three-phase, single-phase, and D.C. three-wire lighting and power, together with traction switchboards. Commencing wage 30s., rising to 34s. per week.

A telephone wireman is required with experience in the maintenance of large private telephone exchanges. (See advertisement on another page.)

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**Callender's Cable & Construction Co.**—At the annual meeting on Thursday, the report and accounts given in our issue for May 7th were adopted. Sir Fortescue Flannery, Bart., M.P., Chairman of the Company, said he did not think that in all the history of the Company there had been a time of greater activity than the years 1912-13, both at home and abroad. A very satisfactory year's trading had been accomplished, and particularly in the case of telephones was the development greatly in advance of any previous year. Especially had the Company been successful in its relations with the General Post Office, whose efforts they were doing their best to second in order to develop the telephone system of the country. Mr. T. O. Callender, the managing director, said that the feature of the past year had been the steady increase of business with the Company's old customers. The only department that had not been altogether satisfactory was the engineering department. The Company had, with many others, been harassed by labour troubles, and especially in the engineering department had these troubles hindered business.

FOR  
STEAM JOINTS  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

# TRADES' DIRECTORY OF ADVERTISERS IN "ELECTRICAL ENGINEERING."

(One Free Entry is given to every Advertiser. Entries under additional headings, 6d. per insertion.)

## ACCESSORIES (Electric Light and General Supplies).

Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
Electrical Co., Ltd., 122 to 124, Charing Cross Rd., W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Gullbert-Martin, 9, Edmund Place, E.C.  
Haslam & Schontheil, Ltd., 11, Windsor Place, Cardiff.  
Lundberg (A. P.) & Sons, Liverpool Rd., N.  
Scholey & Co., Ltd., 151, Queen Victoria St., E.C.  
Simplex Conduits, Ltd., 113 to 117, Charing Cross Rd., W.C.  
Sun Electrical Co., Ltd., 118, Charing Cross Road, W.C.  
Wardle Engineering Co., Ltd., 196, Deansgate, Manchester.

## ACCUMULATORS, &c.

Copper, Pass & Son, Ltd., Bedminster Smelting Works, Bristol.  
D.P. Battery Co., Ltd., Bakewell, Derbyshire.  
Electrical Power Storage Co., Ltd., 4, Great Winchester St., E.C.  
Hart Accumulator Co., Ltd., Marshgate Lane, Stratford.  
Naylor Battery Co., 1, Lammernoor Rd., Balham, S.W.  
Tudor Accumulator Co., Ltd., 3, Central Buildings, Matthew Parker St., S.W.

## ARC LAMPS AND ACCESSORIES.

Drake & Gorham, Ltd., 66, Victoria St., S.W.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electric Firm, Croydon.  
Oliver Arc Lamp Ltd., Cambridge Place, Burrage Rd., Woolwich.

## ARMATURE REPAIRS.

Marryat & Place, 28, Hatton Garden, E.C.

## BOILERS.

Babcock & Wilcox, Ltd., Oriol House, Farringdon St., E.C.

## CABLES AND WIRES.

Callenders Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
General Cable Manufacturing Co., 15, Garlick Hill, E.C.  
Gillespie & Beaks, Amberley House, Norfolk St., W.C.  
Hensley's (W. T.) Telegraph Works Co., Ltd., Blomfield Street, E.C.  
Hooper's Telegraph & Indiarubber Works, Millwall Docks, E.  
India Rubber, Gutta Percha & Telegraph Works Co., Ltd., 104, Cannon St., E.C.  
Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.  
London Electric Wire Co. & Smiths Ltd., Playhouse Yard, Golden Lane, E.C.  
Machintosh (Chas.) & Co., Ltd., 22 & 23, Jewin St., E.C.  
Rickard (Wm.) Ltd., Ashbourne Road Mills, Derby.  
St. Helens Cable & Rubber Co., Ltd., Warrington.  
Siemens Bros. & Co., Ltd., Woolwich.  
Union Cable Co., Ltd., Dagenham Dock, Essex.

## CASTINGS, &c.

Dore (J.) & Co., Bromley, E.

## CATALOGUES AND PROCESS ENGRAVING.

Swain (John) & Son, Ltd., Shoe Lane, E.C.

## CONDENSERS (Electrical).

Telegraph Condenser Co., Ltd., Vauxhall St., Kennington Oval, S.E.

## CONDENSING PLANTS.

Balcke & Co., Ltd., Broadway Court, Westminster, S.W.  
Mirzoe Watson Co., Ltd., Scotland Street, Glasgow.  
Storey (Isaac) & Sons, Ltd., Empress Foundry, Cornbrook, Manchester.  
Williams & Robinson, Ltd., Rugby.

## DIE-FINISHED CASTINGS.

Aerators, Ltd., Upper Edmonton, N.

## DYNAMOS see Motors and Dynamos.

## ELECTRO-PLATING.

Canning (W.) & Co., 138 to 137, St. Hampton St., Birmingham.

## FLEXIBLE METALLIC TUBING.

United Flexible Metallic Tubing Co., Ltd., 112, Queen Victoria St., E.C.

## HEATING AND COOKING APPARATUS.

Belling & Co., Lancaster Works, Derby Road, Edmonton, N.  
British Prometheus Co., Ltd., Salop St. Works, Highgate, Birmingham.  
British Thomson-Houston Co., Ltd., Rugby.  
Dowling Radiant Heat Co., Ltd., 105, Great Portland St., W.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electrical Trading Co., Ltd., 185, Wardour St., W.C.  
Redgle, Ltd., 647, Royal Liver Bldg., Liverpool.  
Schneewindt Electric Co., 40-1, Stamford St., Birmingham.  
Siemens Bros. Dynamo Works, Ltd., 39, Upper Thames St., E.C.  
Simplex Conduits, Ltd., 113 to 117, Charing Cross Rd., E.C.  
Townshend's Art Metal Co., Ltd., Ernest St., Birmingham.

## ICE-MAKING MACHINERY.

Drake & Gorham, Ltd., 66, Victoria St., S.W.

## INSTRUMENTS.

Everett, Edgcombe & Co., Ltd., 117, Victoria St., S.W.  
Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick.  
Kelvin, Bottomley & Baird, Ltd., 18, Cambridge St., Glasgow.  
Nalder Bros. & Co., 7, Carteret St., S.W.  
Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane Dalston, N.E.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
Weston Electrical Instrument Co., Audrey House, Ely Place, E.C.

## INSULATING VARNISH, ENAMELS, PAINTS AND LACQUERS.

Blume (Chas. H.), The White Building, Sheffield.  
Fredk. Crane Chemical Co., Armoury Close, Bordesley Green, Birmingham.  
Griffiths Bros. & Co., Marks Rd., Bermondsey, S.E.  
Northern Varnish Co., Allerton, Bradford.  
Sterling Varnish Co., Royal London Buildings, 196, Deansgate, Manchester.

## INSULATORS AND INSULATING MATERIALS.

Macintyre (J.) & Co., Ltd., Burslem.  
Moseley (D.) & Sons, Ltd., Ardwick, Manchester.  
Mosses & Mitchell, 122 to 124, Golden Lane, E.C.  
Sugg (William) & Co., Ltd., 63, Regency Street, S.W.  
Traut (Dr. Heinr.) & Sons, 25, Goswell Rd., E.C.  
Waldmann (H.), Rapperswil, Switzerland.  
Werths & Co., 41, Aldersgate Street, London, E.C.

## INSURANCE.

Phoenix Assurance Co., Ltd., 19 & 70, Lombard St., E.C.

## LADDERS.

Heathman & Co., 10, Parsons Green, S.W.

## LAMPS (Incandescent).

British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames St., E.C.  
Cryselco, Ltd., Kempston Works, Bedford.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Pope's Electric Lamp Co., Ltd., Hythe Road, Willenden, N.W.  
Siemens Bros. Dynamo Works, Ltd., Tyssen St., Dalston, N.E.  
Simplex Conduits, Ltd., 113 to 117, Charing Cross Rd., W.C.  
Stearn Electric Lamp Co., Ltd., 47, Victoria St., S.W.  
Watlington & Co., Ltd., 48, Milton St., E.C.  
"Z" Electric Lamp Mfg. Co., Ltd., Orient House, New Broad St., E.C.

## LIFTS.

Marryat & Place, 28, Hatton Garden, E.C.  
Waygood (R.) & Co., Ltd., Falmouth Road, S.E.

## MACHINE TOOLS.

Taylor & Challen, Ltd., Constitution Hill, Birmingham.

## METERS.

Bastian Meter Co., Ltd., Kentish Town, N.W.  
British Thomson-Houston Co., Ltd., Rugby.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
Isaria, Ltd., 208, Tower Bridge Road, S.E.

## MICA.

British Mica Co., Ltd., Lebanon Road Works, Wandsworth, S.W.  
Jaroslaw (D.), 19, Tower Hill, E.C.  
Micanite & Insulators Co., Ltd., Walthamstow, E.  
Wiggins (F.) & Sons, 102 to 104, Minories, E.C.

## MINE EQUIPMENTS AND APPARATUS.

Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Rayrolle & Co., Ltd., Hebburn-on-Tyne.  
Siemens Bros. Dynamo Works, Ltd., Caxton House, Westminster, S.W.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.  
Williams & Robinson, Ltd., Rugby.

## MOTORS AND DYNAMOS.

British Thomson-Houston Co., Ltd., Rugby.  
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.  
Brown Boveri & Co., Ltd., Caxton House, Westminster, S.W.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
London & Rugby Engineering Co., Ltd., 10, Bush Lane, E.C.  
Matthews & Yates, Ltd., Swinton, Manchester.  
Peabees (Bruce) & Co., Ltd., Edinburgh.  
Siemens Bros. Dynamo Works, Ltd., Caxton House, Westminster, S.W.  
Vickers, Ltd., River Don Works, Sheffield.

## OIL CANS.

Kaye (J.) & Sons, Ltd., Lock Works, Leeds.

## PACKING.

United States Metallic Packing Co., Ltd., Bradford.

## PATENT AGENTS.

Lorain (J. G.), Norfolk House, Norfolk St., W.O.  
Ravorth (J. E.), 30, Broadway, Westminster.

## PUMPING PLANT.

Merryweather & Sons, Fire Engine Works, Greenwich, S.E.  
Williams & Robinson, Ltd., Rugby.

## STAMPINGS.

Harris (A. E.) & Co., 95, Camden St., Birmingham.

## STEAM ENGINES AND TURBINES.

Allen (W. H.) Son & Co., Ltd., Queen's Engineering Works, Bedford.  
British Thomson-Houston Co., Ltd., Rugby.  
Dick, Kerr & Co., Ltd., Abchurch Yard, E.C.  
J. Howden & Co., Ltd., 195, Scotland St., Glasgow.  
Vickers, Ltd., River Don Works, Sheffield.  
Williams & Robinson, Ltd., Rugby.

## STEAM ENGINE ACCESSORIES.

Lea Recorder Co., Ltd., 32, Deansgate, Manchester.

## SWITCHGEAR.

British Thomson-Houston Co., Ltd., Rugby.  
Dorman & Smith, Ltd., Ordeal Electrical Works, Salford.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Ellison (George), Warstone Lane, Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.O.  
Granite Electric Co., Ltd., 147, Queen Victoria St., E.C.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
Reynolds & Co., Ltd., Hebburn-on-Tyne.  
Switchgear & Cowans, Ltd., Springfield Lane, Salford, Manchester.

## TECHNICAL BOOKS AND JOURNALS.

Cambridge University Press, Fetter Lane, E.C.  
Cassell & Co., Ltd., La Belle Sauvage, K.C.  
Caxton Publishing Co., Clun House, Surrey Street, Strand, W.O.  
Constable (Archibald) & Co., Ltd., 10 Orange St., Haymarket, W.  
Crosby Lockwood & Son, 7, Stationers' Hall Court, E.C., and 5, Broadway  
Electric Journal, Donington House, Norfolk St., Strand, W.O. [Westminster, S.W.]  
Gresham Publishing Co., 34, Southampton St., W.C.  
Griffin (Chas.) & Co., Ltd., 12, Exeter St., Strand, W.O.  
Indian Industries and Power, 204, Temple Chambers, E.C.  
Longmans, Green & Co., 39, Paternoster Row, E.C.  
Macmillan & Co., Ltd., St. Martin's St., W.C.  
Whittaker & Co., 2, White Hart Street, Paternoster Square, London, E.C.

## TELEPHONES.

Drake & Gorham, Ltd., 66, Victoria St., S.W.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Graham (Alfred) & Co., St. Andrew's Works, Crofton Park, London, S.E.  
Siemens Bros. & Co., Ltd., Woolwich.  
Western Electric Co., Ltd., North Woolwich, E.

## TESTING LABORATORIES.

Electrical Standardising, Testing & Training Institution, Ltd. (Faraday House), 62 to 70, Southampton Row, W.C.

## TRANSPORTERS.

Bleicherts Aerial Transporters, Ltd., Egypt House, 36, New Broad St., E.C.

## WIRING CONTRACTORS. See page iv.

## WOODWORK CASING AND CONDUITS.

Jennings & Co., Pennywell Rd., Bristol.

When corresponding with Advertisers, please mention "Electrical Engineering."

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 387 [VOL. X., No. 22]  
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THURSDAY, MAY 28, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

At the Annual General Meeting of the Institution of Electrical Engineers last Thursday, interesting statements were made by the Chairman and Vice-Chairman of the Industrial Committee, who, although both members of Council themselves, were in conflict with the Council itself as to the duties which the Committee might properly perform. The limitations imposed by the Council on the scope of the Committee, they explained, had prevented its doing the work which, it had been hoped, could be done. Mr. Robert Hammond, at the same meeting, explained in his most convincing manner that the decrease in membership of the Institution was really an increase. (Page 292.)

An account is given of the remarkable action taken by the Bethnal Green Borough Council in connection with its projected electricity undertaking; Mr. J. F. C. Snell has refused to act for the Council further as Consulting Electrical Engineer. (Page 292.)

An illustration is given of the type of double helical gearing used in geared turbo-generators such as that at the Horseferry Road Station at Westminster. (Page 293.)

SMALL half-watt lamps for low voltages are being introduced in Germany which can be used for automobile head lamps, and in conjunction with small step-down transformers for house lighting. (Page 293.)

We are able to publish an illustration of one of the Diesel engines built for the new Macclesfield Electricity Works. (Page 293.)

THE electric drive of planing machines is dealt with in our Questions and Answers columns. (Page 294.)

SOME Patent specifications published last week deal with phase regulation of alternators connected in parallel, control of winding motors, vapour arc lamps, and oil-cooled transformers. A lapsed Patent relating to conduit fittings has been restored by the Comptroller. Opposition has been entered to a Patent of Crompton & Co. for a system of motor control. Proceedings in Opposition to the grant of a tungsten Patent were heard before the Comptroller last Monday, the opposers being the B.T.-H. Co. and C. Gladitz. (Page 295.)

THE railway from Stockholm to Saltsjöbaden is to be converted to electric traction on the 1200-volt D.-C. system. (Page 296.)

THE year's working of Hull Municipal Telephone system has resulted in a profit of £2,631.—The new Transatlantic wireless station near Carnarvon was inaugurated last week.—The Marconi v. Helsby wireless patent action will be heard on June 23rd. (Page 296.)

OUR Trade Section contains descriptions of a ship-board electric clock installation, an electric floor cleaning machine, a switch panel for 800 volt lighting circuits, an alternating-current buzzer, and illustrates a semi-indirect lighting installation, and some alabaster dishes for this kind of illumination. (Pages 296 and 298.)

TURBO-GENERATORS are required in Dartford and Auckland; expenditures on generating plant are contemplated as follows: Bootle (£19,312); Cleethorpes (£10,000); Falkirk (£5,799); Huddersfield (£21,500); Kettering (£3,000); Leeds (£212,000); Shoreditch (£22,000); Southwark (£10,000); and Redditch (£18,000); rotary converters are required by the L.C.C., and a new storage battery at Horsham. (Page 299.)

A LARGE number of miners' houses have been wired out in Ashington.—A keen fight is being carried out between the Islington Electricity Committee and the Gas Light & Coke Co. with regard to the lighting of the Islington Guardians' buildings.—The "Northumberland" clause will probably after all be inserted in the Kingstown electric lighting order.—The Hackney Electricity Committee recommends certain variations in the proposed tariff for charging electric vehicles. The Barnes Council, on the other hand, has adopted the scheme put forward by the Electric Vehicle Committee in its entirety. (Page 300.)



## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, MAY 28TH.

*Institution of Railway Signal Engineers.*

2.30 p.m. At Institution of Electrical Engineers. "American Signal Practice as Compared with British Practice," by A. H. Rudd.

THURSDAY, JUNE 4TH.

*Institution of Mining Engineers.*

11 a.m. At Burlington House, Piccadilly. "Development of the Internal Combustion Engine for Power Generation at Collieries," by J. Davidson.

*Royal Institution.*

3 p.m. Lecture I., by Prof. S. P. Thompson, F.R.S., on "Faraday and the Foundations of Electrical Engineering."

### The London Electrical Engineers.

Headquarters (46 Regency Street, S.W.) open Sats. till noon. Closed Monday, June 1st, and Tuesday, June 2nd, for Whit-sun holidays. *Rating Exam.* for all Cos. from 7 to 10 p.m. every Wednesday.

(TO-DAY) THURSDAY, MAY 28TH, C. Co. FRIDAY, MAY 29TH, D. Co. THURSDAY, JUNE 4TH, C. Co. FRIDAY, JUNE 5TH, D. Co.

## ANNUAL MEETING OF THE INSTITUTION OF ELECTRICAL ENGINEERS

THE annual meeting of the Institution was held on Thursday. At the commencement a vote of condolence was passed with the family of the late Mr. R. Kaye Gray. The announcement of the election of Members of Council was made as reported in our last issue, and the Council's Report was presented.

*The Decrease in Membership.*—In answer to a question by Mr. F. C. Raphael (Editor of ELECTRICAL ENGINEERING), Mr. Robert Hammond, as Chairman of the Membership Committee, said it was true that there had been a decrease of 39, which on the face of it might appear to be a calamity, but when the position was analysed this was far from being the case. The membership was now 508 more than it was two years ago. The comparison must not be made simply with the previous year, for there had then been a large number of new members joining to get in before the higher subscriptions for new members came in force.

*The Council Ballot.*—The President, in answer to another question by Mr. Raphael, said he did not believe the fact that the ballot papers having been sent out with the proceedings had any appreciable effect on the number of papers returned. As a matter of fact, 23 per cent. were returned this year, which was a larger percentage than last year, when the ballot papers were sent out in separate envelopes. Nevertheless it was proposed that in future the ballot papers should be sent out in separate envelopes.

*Municipal Loans Committee.*—Mr. W. C. P. Tapper, Borough Electrical Engineer, Stepney, speaking with reference to the Municipal Loans Committee mentioned in the report, expressed the hope that the Council would be well represented upon it, as otherwise there was a fear that this Committee would meet the same fate as the Industrial Committee. The President said that already three company engineers and three municipal electrical engineers had been appointed on this Committee.

*Model General Conditions.*—Mr. Tapper also asked whether the Model General Conditions had received the approval of the B.E.A.M.A. and of the I.M.E.A.

The President said that neither the B.E.A.M.A. nor the I.M.E.A. had formally adopted the Model General Conditions, but he believed the B.E.A.M.A. was very much in agreement with a great many clauses, and he hoped that the I.M.E.A. also was.

### The Industrial Committee.

Mr. H. Hirst said that, as Chairman of the Industrial Committee, he would like to say a few words in order to prevent any misunderstanding in the minds of the members. The Council had considered it essential that the Industrial Committee should not deal with matters which might be construed as having a political bearing. The Members of Council on the Committee were anxious to respect this wish, but when it was considered that there were 400 municipal electrical stations in the country, it would be difficult to find subjects connected with electricity supply which did not have something of a political nature about them. The Council had other wishes which did not appear in the constitution of the Committee. They considered that the Committee should not touch upon questions which might be to the detriment of a certain section of its members, and some members of the Committee were anxious to respect this wish, but others were not, because when it was a matter of benefit to the whole industry it might be thought one section might have to give way a little for the general good. As the Council had made this ruling, however, it was difficult for the Industrial Committee to choose suitable subjects which were likely to meet with the approval of the Council. Other members of the Council thought that the In-

stitution would suffer in prestige if it lent its name to discussions dealing with money matters, such as finance or trade discounts that were likely to enter into the discussion of industrial questions. It was due to him as Chairman of the Committee, and also to some of the members, to say that the above were some of the limitations of the constitution which had not been referred to in the report, and which acted against the possibility of the Industrial Committee doing such work as it was hoped could have been done.

Later on in the proceedings, Mr. A. H. Seabrook said that as Vice-Chairman of the defunct Industrial Committee, he regretted that the Institution could not see its way to become the centre of the industry in commercial and industrial matters as well as in technical matters. All members of the industry were dependent upon £ s. d., and whether their interests were scientific or technical, the question of finance and commercial matters was of essential importance not only for the existence of the Institution as a whole, but for the individual members. It was regrettable that the Articles of Association did not permit of the Council taking its full share in these industrial and commercial matters. It was evident by the attendance at the meeting, and the complacent attitude shown that the members were perfectly satisfied, unlike himself, with the Institution which confined itself to those matters for which it was originally constituted. He was not making these remarks by way of complaint, but merely by way of regret.

Mr. K. Edgumbe said he would like to say "Amen" to Mr. Seabrook's remarks.

Mr. W. W. Mordey said he would like to say a few words on the other side, because he believed that the interests of the Institution could be best maintained by following an example always before them, and giving attention to the foundations of electrical engineering—the scientific and technical foundations—rather than attempting in any way to lower the dignity of the Institution by making it a trade association.

This was all the discussion on the report, which was then unanimously adopted.

### The Tothill Estate.

#### Suffragettes and Socialists as short-period tenants.

Arising out of the Treasurer's statement, Mr. Raphael asked for some explanation why the net revenue from the Tothill estate was only £302, which amounted to about 1½ per cent. of the capital outlay upon it. Mr. Robert Hammond, the Honorary Treasurer, said that the reason for this was that the Council had felt it to be the best policy not to encourage seven, fourteen, or twenty-one years' tenancies, so that if a favourable offer came into the market, the property could be sold out quickly. This had resulted in its being impossible to obtain the full rental value of the premises, as people would not take them up on the short leases. Since the accounts were published, however, the "suffragettes" had made a favourable offer for some of the premises, and at the Council meeting that afternoon, the Fabian Society—whether it was cause and effect he did not know—had offered to pay £250 a year rent for another part of it, so that the revenue from the Tothill estate for the coming year would be the highest value yet obtained, namely, £886 as against £550 in previous years.

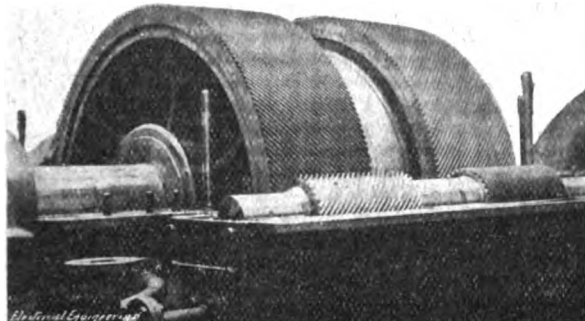
The usual votes of thanks to the Council and honorary officers, with the re-election of the latter, closed the proceedings.

## HOW NOT TO TREAT A CONSULTANT

MR. J. F. C. SNELL, who was acting as Consulting Engineer to the Bethnal Green Borough Council, has been treated in a remarkable manner, which has resulted in his refusing to act for the Council any further. It will be remembered that, on Mr. Snell's recommendation, arrangements are being made for a supply of electricity in the district, taking current in bulk from the neighbouring Stepney Borough Council, and an agreement has actually been made with the Borough Council for a supply. The Electricity Committee recommended that Mr. Snell be appointed to carry out the scheme adopted, at a fee of 5 per cent. of the capital expenditure. This was not carried in the Council, however, and the Committee were instructed to advertise for a consulting electrical engineer to proceed with the scheme. The Association of Consulting Engineers then took the matter up, and informed the Committee that it was against the rules of professional etiquette for any consulting engineer to reply to advertisements, and the Committee therefore again submitted their recommendation that Mr. Snell be appointed, as above. After a long and heated discussion this was carried, whereupon a letter sent by Mr. Snell (who did not know that the Association of Engineers had done anything in the matter) declining to act further in connection with the matter was somewhat belatedly read. This letter was referred to the Electricity Committee, who again approached Mr. Snell and informed him of the official resolution appointing him. Mr. Snell has, however, refused to reconsider his decision.

## A GEARED TURBO-GENERATOR

IN last week's *ELECTRICAL ENGINEERING* (p. 279) an illustrated description was given of the 1,500-kw. continuous-current generator driven at 300 r.p.m. through 10 to 1 gearing by a steam turbine running at 3,000 r.p.m. We are now able, through the courtesy of Messrs. C. A. Parsons & Co., the makers of the turbine and gearing, to reproduce a photograph of a similar gear-case open, which shows the nature of the gearing very well. As already pointed out, this gearing is on the same general lines as the Parsons' marine gearing, consisting of two wide helical gear rings with the slope in opposite directions to balance the end thrust. The



REDUCTION GEARING FOR STEAM TURBINE.

pinion is solid steel, and the gear-wheel consists of a cast-iron drum, over which are shrunk and keyed the two mild steel rings, each 15 in. wide and about 6 ft. in diameter, in which the teeth are cut. The gear is lubricated by oil squirted continuously at the line of contact of the teeth. A flexible coupling is provided between the turbine and the pinion shaft, but the armature of the generator is coupled rigidly to the gear-wheel shaft. In some other makes of turbine gearing floating bearings are used for the pinion shaft, enabling it to take up its own position, but Messrs. Parsons do not find this necessary, and, in accordance with their usual practice, have fitted solid bearings.

## SMALL LOW VOLTAGE HALF-WATT LAMPS

IN addition to the great progress being made with half-watt lamps for ordinary supply voltages and large candle-powers, several new sizes of which are already on the market in Germany, and may be expected before long to be ready for sale in this country, attention of manufacturers has been devoted to the manufacture of units of small candle-power of equally low specific energy consumption. These, however, are so far only practicable at quite low voltages, but there is a special field where there is no disadvantage, namely, for automobile lighting. In Germany, the *Auergesellschaft* are already advertising Osram "half-watt" lamps for motor-car headlights with short thick drawn-wire filaments in the 32, 50, 75 and 100 (hefner) candle-power sizes for 6 and 8 volts, and 50, 75, and 100 c.p. for 10 and 12 volts. It was the ordinary metal-filament lamp which made electric headlights possible, but the introduction of half-watt lamps will materially reduce the size and cost of the batteries or lighting sets required, besides increasing the economy of working to a point competing easily with acetylene.

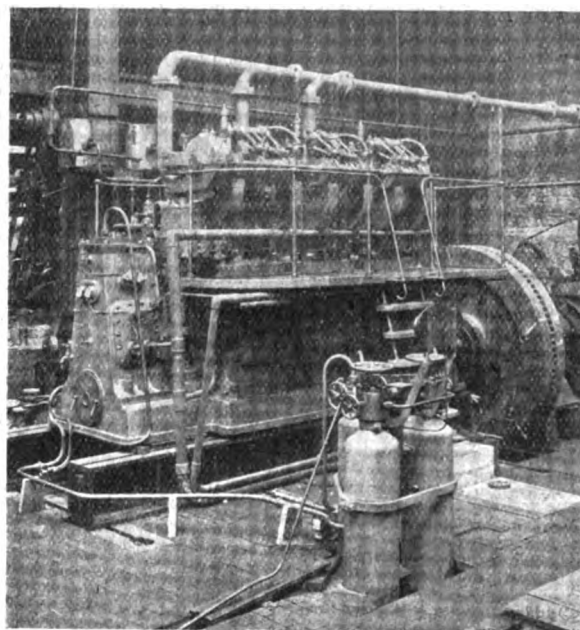
For ordinary illumination purposes, small half-watt lamps have also been introduced in Germany, used in conjunction with small step-down transformers, and these transformers are standardised in sizes of 10, 25, and 75 watts, with a secondary pressure of 14 volts, and for 450 and 750 watts with a secondary voltage of 60. The smaller sizes for single lamps are extremely compact, and fit in like adaptors between the lamp-holder and the lamp, while others are combined with a lamp-holder. The gain in efficiency of the lamp over that of the ordinary metal-filament lamp much more than compensates for the loss in the transformer.

In reference to the interview with Herr Rathenau, published in the *Berliner Tageblatt*, and referred to in our issue of May 14th, the *Elektrotechnische Zeitschrift* states that the 25 c.p. and 50 c.p. half-watt lamps referred to as shortly being on the market are A.E.G. ("Nitra") lamps of low voltage, only suitable for use in series, or for supply through low-voltage transformers. These are now being advertised in Germany by the A.E.G. Co. in sizes down to 50 c.p.

**Iron and Steel Institute.**—The autumn meeting of the Iron and Steel Institute will be held in Paris from September 17th to 22nd.

## DIESEL ENGINES AT MACCLESFIELD

WE referred in *ELECTRICAL ENGINEERING*, April 30th, p. 248, to the opening of the new station for the supply of Macclesfield, and through the kindness of Messrs. Hick, Hargreaves & Co. we are now able to illustrate one of the two Diesel engines of their manufacture which form part of the equipment. These are each of the three-crank vertical type, with cylinders 16 in. diameter by 19 in. stroke, running at 250 r.p.m. They are of the enclosed forced-lubrication type and their general appearance is seen in the photograph of one of them erected on the manufacturers' test bed. Although Messrs. Hick, Hargreaves & Co. have only taken up the manufacture of Diesel engines comparatively recently, this is not the first that they have supplied for electrical purposes, and another example that may be men-



250-H.P. DIESEL ENGINE FOR MACCLESFIELD.

tioned is a 500-B.H.P. three-crank engine supplied to the Guildford Electricity Supply Co. The Company's designs follow in many respects what may now be regarded as practically standard practice, based on accumulated experience, but in comparison with other makes they claim that their engines are particularly substantial and are designed to stand up for long periods under full load without giving trouble. The bearing surfaces throughout are very large, and the lubrication is carefully attended to. The aim has been to make a thoroughly sound and reliable engineering job throughout.

**Proposed Housing of Engineering Societies in Manchester.**—A conference of representatives of Engineering and Technological Societies in Manchester was held on May 1st to consider the possibility of establishing a common headquarters for the various societies and institutions which hold meetings in Manchester. Sir Thomas Holland was in the chair. Resolutions were adopted in favour of such a scheme of co-operation, and the following gentlemen were invited to form a provisional Organising Committee:—Mr. W. T. Anderson (convener), Mr. C. Pilkington, and Sir T. H. Holland (Manchester Geological and Mining Society), Mr. J. A. F. Aspinall (Institutions of Civil and of Mechanical Engineers), Mr. E. J. Christian (Junior Institution of Engineers), Mr. R. H. Clayton (Society of Chemical Industry), Mr. H. L. Foster (Association of Mining Electrical Engineers), Mr. E. G. Hiller and Dr. E. Hopkinson (Manchester Association of Engineers), Mr. R. Matthews (Institution of Mechanical Engineers), Mr. F. R. McConnell (Textile Institute), Mr. J. G. Newbigging (Institution of Gas Engineers), Mr. S. L. Pearce (Institution of Civil Engineers), Dr. E. Rosenberg and Mr. E. D. Simon (Institution of Electrical Engineers), Mr. J. H. Stubbs (Manchester Engineers' Club), and Mr. W. H. Whitby (Engineering Employers). This committee is to ascertain the views of the Councils of the respective societies and to prepare a scheme.

**Meter Approved.**—The Board of Trade has approved the Ferranti Polyphase Watt-Hour Meter Type C.T., and the means for fixing same.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,393.

In house-wiring installations consisting only of plain pendants, compare the relative advantages and disadvantages of: (1) looping-in in the ordinary way both at the ceiling roses and switches, or (2) using 3-plate ceiling roses and looping-in only at the ceiling roses.

(Replies must be received not later than first post, Monday, June 8th.)

### ANSWERS TO No. 1,391.

A 20-h.p. shunt-wound motor running at 510 r.p.m. has been put in to drive the main shafting of a machine shop at 120 r.p.m. The rated full load current is 75.5 amperes at 220 volts. When the planing machine is in action this current is not exceeded on the cutting stroke, but rises to 120 amperes on the return stroke. Will some reader suggest a remedy? Would it be practicable to alter the gear ratio between the motor and shafting, and to increase the speed of the motor by weakening its field?—"ELECTRIC MOTOR DRIVE."

The first award (10s.) is made to "W. H." for the following reply:—

Dealing first of all with the solution propounded by the querist, it would appear difficult to find a reason for speeding-up the motor, but possibly the idea is to utilise the extra rotational energy stored in the moving parts of the motor at the higher speed to help the motor at the moment the planer reverses. The gain would not, however, be very great, owing to the small radius of gyration of the moving parts, and there would be considerably increased sparking, due to the higher speed and weaker field. As this is obviously a reversible belt-driven planer, the best and cheapest method would be to fit a heavy flywheel-pulley in place of the planer-pulley driven from the shop shafting. Assuming this to be approximately 3 ft. in diameter, a weight of about 5 cwt. to 6 cwt. concentrated in the rim of the pulley would probably reduce the kick of current to a reasonable value. The reason for this is that during the cutting stroke the power taken by the planer is less than at any other period. The resulting tendency to speed-up stores energy in the flywheel, and this stored energy is delivered during the moment of reversal, and to a small extent during the high-speed return stroke. The result being, of course, a slowing-up of the flywheel. This should considerably reduce the variations in load on the motor, and a further improvement could be effected by adding a few series turns wound cumulatively on the motor fields. The effect of the series turns being to produce a slightly increased speed-drop between no-load and full-load, thus utilising the stored energy of the flywheel to a greater extent. In case a flywheel pulley could not be fitted, a flywheel of similar dimensions should be fitted to the same shaft. It is now the practice with first-class makers to compound slightly D.C. motors for this class of work.

The second award (5s.) is given to "ASTATIC," who says:—

"Electric Motor Drive" is experiencing the usual conditions which exist when shunt-wound motors are used to drive planing tables. The power taken when the tool is cutting is nothing when compared with the power required to reverse the machine and return the table to the cutting position again. Planing

tables in some cases weigh many tons, and as the rate of return is nearly twice the cutting rate, it will be seen that an additional amount of power is required. The motors driving these machines should have sufficient surplus of power to meet the sudden reversal and increase of speed, otherwise considerable sparking will take place, which heats the commutator, so that eventually it will be impossible to keep it free from flats, and the mica will always be standing above the segments.

"Astatic" then suggests fitting a smaller pulley on the shafting which drives the planer countershaft to decrease the speed of the machine; tightening the belts which are worked by the striking gear, and overhauling the motor bearings to see if they are worn, so that the armature is in an unsymmetrical field. He then makes the following proposal for compound winding:—Remove the armature and place the yoke of the motor on a bench, so that it is easy to get at the field coils. Then obtain about twenty-five yards of circular annealed copper wire, double cotton covered, No. 1, S.W.G. This wire will carry about 80 amperes without heating. Wind upon each shunt field coil about ten turns of this wire in the following manner. Cut a number of pieces of vulcanite  $\frac{1}{4}$  in. thick, eight pieces for each pole, as shown in Fig. 1, and fasten them to the pole piece



Fig. 1.

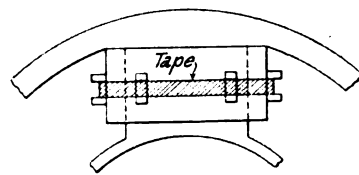


Fig. 2.

with tape, as shown in Fig. 2. Then cut some strips of mica to the size of the grooved portion of the vulcanite, sufficiently long to extend the whole length of the coil. Place the mica in the groove at the back, bottom, and top, and wind the copper wire on the "former" thus made.

When ten turns have been placed on each coil there will be a space between the new coil and the shunt coil. This will enable you to tape the coil up with linen tape, after which it should be well varnished with shellac varnish.

If the new coil should be a little slack it may be tightened by inserting a few small ash wedges between the back of the new coil and the front of the field coil. The coils should then be connected up in series with each other, and the whole placed in series with the armature. We have now converted the shunt machine into a compound machine at a very small cost, and there is no doubt that it will do its work in a satisfactory manner.

He concludes:—What we have done electrically is this. When the planing table is reversed, and the table is returning quickly to the cutting position, the additional current will traverse the new series turns and the field strength will be much greater. The result is that the speed will be decreased a little, but the field distortion and armature reaction will be considerably decreased, and it will be found that the motor will not be taking much more than the full-load current. If there is a slight increase in the current it will not be detrimental to the efficient working of the motor, as it will be intermittent, and there will be no sparking at the brushes, but it may be necessary to move the brushes in a forward direction, as the neutral position will be altered.

Care must be taken to see that the series turns are wound in the same direction as the shunt turns, and that the armature current is traversing these turns in the same direction as the shunt current.

**London Electricity Supply.**—At Tuesday's meeting of the London County Council, the Finance Committee recommended that loans by several Borough Councils for electricity supply purposes be sanctioned. This was opposed by Mr. O. Lewis, who had also a motion on the agenda instructing the Council's Electricity Supply Committee to report further in three months. It was pointed out, however, that any scheme of the Council's could not be approved by Parliament before next session, that it would take three or four years to erect a power station, and that in the meantime the Borough Council electricity undertakings must discharge their statutory obligations to supply new consumers.

**List of Supply Stations.**—A very conveniently arranged booklet containing tables of particulars of electric supply undertakings, tramways, and railways, and electric power companies has been issued at the price of 1s. net by Messrs. H. Alabaster, Gatehouse & Co. (4 Ludgate Hill, E.C.), which, if not quite as complete as some existing lists, is in the most convenient form of any that we have seen.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published May 21st, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

10,609/13. **Phase Regulation of A.C. Machines.** A. E. G. This specification describes a method of automatic maintenance of phase equality between alternators connected in parallel. Any known type of phase-responsive instruments may be employed. The phase difference between the equalising current flowing from one alternator to the other, and the main current of one of the alternators, is utilised to operate the instrument, which in turn can be made to alter the excitation of the alternator in question, so as to correct the phase inequality between the two machines. Twelve figures.

11,313/13. **Control of A.C. Commutating Motors.** SIEMENS SCHUCKERTWERKE GES. This invention applies particularly to winding motors. The control is effected by a lever which determines the position of the brushes relative to the neutral position. An auxiliary lever is provided by which the connections of the stator can be altered for either backward or forward running. For braking, the control lever is moved so as to bring the brushes to the other side of the neutral position, thus causing the motor to supply current to the mains. Braking resistances are at the same time switched into the circuit. The control lever and the auxiliary lever are connected through linkwork, so that the braking resistances cannot be switched in until the brushes have passed the neutral point. Five figures.

15,046/13. **Vapour Arc Lamps.** DEUTSCHE GASÖHLICHT AKT.-GMS. The body of the lamp is filled with a gas which, during the operation of the lamp, is driven out of the arc chamber, by the vaporised mercury, into either a special cooling chamber, or into the atmosphere. In the latter case the gas used is air; in the former, neon or argon can be used. The outlet from the arc chamber must be long enough to prevent the escape of the mercury vapour. To start the lamp, the mercury is caused to boil either by external heating or by tilting the lamp so as to short-circuit the anodes. Three figures.

24,162/13. **Oil-cooled Transformers.** H. WEISS. To prevent the deleterious effects which are due to the presence of air above the surface of the oil, this specification describes a means by which the transformer case can be completely filled with oil. An outlet pipe communicates with a vertical cylinder in which a weighted piston works. When the oil expands, the piston rises. The weight of the piston serves to maintain a pressure in the transformer casing, which effectively prevents the cooling liquid from leaking into it through the material of the cooling coils. Three figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Names in italics indicate communicators of inventions from abroad.**

**Distributing Systems, Cables and Wires, &c.:** B. I. & H. C. and MORDEY, ASTLEY & SAUNDERSON [Conductors and supports] 7,805/13; HODGSON [Wiring] 15,643/13; WESTERN ELECTRIC CO. (*Woodward*) [Insulated conductors] 26,684/13.

**Dynamos, Motors and Transformers:** A.E.G. [Dynamo-electric machines] 7,784/13, 10,608/13; B.T.-H. and TAYLOR [Dynamo-electric machines] 10,919/13; B.T.-H. (*G.E. Co., U.S.A.*) [High-frequency generators] 11,240/13.

**Electrometallurgy and Electrochemistry:** WATTMANN and TUDOR ACCUMULATOR CO. [Welding of rails] 11,847/13; ELLIS (*Sodium Process Co.*) [Furnace] 29,418/13.

**Ignition:** LONGFORD & CLARK [Spark plug] 7,365/13, 19,838/13; KETTERING and CHRYST [Ignition system] 6,074/14.

**Incandescent Lamps:** B.T.-H. (*G.E. Co., U.S.A.*) 10,918/13; JOHANN KREMENEZKY [Manufacture of metallic filament lamps] 19,838/13; PORDES [Portable lamps] 3,992/14.

**Instruments and Meters:** RYAN and BROWN [Earthing device for testing purposes] 10,987/13; KELVIN & JAMES WHITE, LTD., and KING & ALEXANDER [Mariners' compass] 11,158/13; EVERSHED & VIGNOLES and CLARK & SENIOR [Contacts] 15,968/13; STEPHENSON [Voltmeter] 21,143/13; HOTHAM and WILSON [Recording instruments] 91/14.

**Storage Batteries:** SABLON [Accumulators] 16,684/13.

**Switchgear, Fuses and Fittings:** RAILING and GARRARD [Motor control] 10,416/13; PACE and KELUM [Switches for signalling systems] 10,717/13; BLOXAM (*R. Bosch*) [Regulators] 25,046/13; CUMONT [Motor control] 27,988/13; HITZELBERGER and NEW BRITISH EVER-READY CO. [Switches] 970/14.

**Telephony and Telegraphy:** RADIO SIGNAL CO., SHEPARD and MCKECHNIE [Aerial or submarine wireless systems] 3,103/13; JOHNSON [Telephone system] 10,864/13; MARCONI'S WIRELESS

TELEGRAPH CO. and RYAN [Wireless telegraphy] 11,106/13; LEIMBACH [Wireless telegraphy] 5,535/14.

**Traction:** HUNT (*Gresham*) [Insulated railway van] 28,963/13.

**Miscellaneous:** RALPH [Gas detector for hand lamps] 5,568/13; KNABE, GREENWALD and FARMAN [Horns] 10,396/13; FORSTER [Magnetic coupling] 13,308/13; BEY [Advertising device] 15,348/13; KEMP & LAURITZEN [Relays] 29,448/13; BUCKY [Röntgen ray appliance] 7,788/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** STEINMANN [Mercury vapour lamps] 10,523/14.

**Dynamos, Motors and Transformers:** SIEMENS SCHUCKERTWERKE GES. [Rotary transformers] 10,493/14; LA COUR [Converter] 10,562/14.

**Electrometallurgy and Chemistry:** DEUTSCHE GOLD UND SILBERSCHEIDE ANSTALT VORM. ROSSLER [Electrolytic preparation of metals] 10,193/14.

**Ignition:** R. BOSCH [Engine starters] 560/14.

**Incandescent Lamps:** SCHMIDT [Pocket lamps] 8,353/14.

**Instruments and Meters:** SIEMENS & HALSKE AKT. GES. [Time recorders] 10,477/14.

### Proceedings in Opposition. May 25th, 1914

13,282/12. **Manufacture of Ductile Masses of Tungsten, &c.** P. SCHWARZKOPF, S. BURGTALLER, and WOLFRAM LABORATORIUM DR. ING. P. SCHWARZKOPF. The specification, of which an abstract was given in our issue of October 9th, 1913, page 572, relates to the preparation of ductile tungsten by a process of pressing and sintering, from oxygen containing powders of the metal. The claim was opposed by two parties, viz., C. Gladitz and the B.T.-H. Co. The former based his opposition upon the fact that the process described by the above specification requires that when sintering is complete, the pressure must be relieved on three sides of the mould simultaneously by any of the known methods. It was contended that C. Gladitz's Patent No. 12,244 of 1912 anticipated this. The Comptroller pointed out that if the applicants infringed upon this patent in carrying out their process, there was the usual remedy. He could not, however, allow the opposition upon this point. The B.T.-H. Co. then submitted that (1) no new invention was disclosed in the specification; (2) the method of carrying out the process was not properly described. The applicants claimed novelty in the production and use of a *fine-grained* powder of high density, whereas Specification No. 8,031, of 1910, which was cited by the B.T.-H. Co., requires the use of a *comparatively coarse-grained* powder of high density. It was suggested that the "fine grain" of the applicants' specification was identical with the "comparatively coarse grain" of the previous specification. Novelty was also claimed in that the process described in the specification yields tungsten metal having in solution a small percentage (0.1 to 5 per cent.) of oxygen. The B.T.-H. Co. claimed that this is practically what results from the process described by Specification No. 4,644 of 1908. In support of the second ground of opposition, the opponents refer to that part of the specification which states that the pressure of the hydrogen which is used for reducing must be less than the partial pressure of oxygen when the latter is combined to form the lowest oxide of tungsten. Expert evidence was brought to show that this pressure cannot be ascertained by any known means, so that the specification was impracticable. The Comptroller reserved his decision upon the two latter points.

### Restoration of Lapsed Patents

9,537/08. **Junction boxes for metallic conduits.** An Order has been made restoring this Patent to C. VAUGHAN and C. BIRCH on the 11th of May, 1914.

### Opposition to Grant of Patents

6,806/13. **Motor-control for regenerative systems.** CROMPTON & CO., LTD. Opposition to this Patent has been entered.  
19,345/12. **Dynamo for lighting vehicles.** S. L. PRICE. The Comptroller has decided to allow the grant of this Patent.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, &c.:** B.T.-H. and E. B. WEDMORE [Circuit-breaker for A.C. systems] 3,192/09.

**Dynamos, Motors and Transformers:** J. BRKE [Dynamo windings for three-wire distribution] 21,584/07.

**Electrochemistry and Electrometallurgy:** AKT. GES. BROWN, BOVERI, ET CIE [Nickel-iron alloy for turbine blades] 27,217/09.

**Storage Batteries:** P. MARINO [Accumulator plates] 2,683/09.

**Switchgear, Fuses and Fittings:** J. BELCHER [Tumbler switch] 3,130/09.

**Miscellaneous:** W. SCHRÖDER [Electric clocks] 2,596/09.



## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A report has been submitted by the Hull Corporation Telephones Committee dealing with the work of the Department for the year to March 31st. The gross profit amounts to £6,270, an increase of £416 on the previous year, and after meeting capital charges there is a surplus of £2,631. The Manager reports that it has been possible to link up the additional subscribers of the late Post Office system without adding to the exchange or underground plant. In moving the adoption of the report, the Chairman of the Committee expressed the opinion that if such a statement had been made some years ago the telephone systems throughout the country would by now have been in the hands of the municipalities.

The completion of the Cefndu wireless transmitting station near Carnarvon, referred to last week, was celebrated on Wednesday of last week by a dinner given at Carnarvon to Mr. Marconi. The station, which takes power from the North Wales Power Co., is to communicate direct with a station yet to be completed at New Jersey, and works in conjunction with the receiving station at Towyn, from which it is controlled. Communication is at present carried on with Glace Bay. In addition to the regular transmitting equipment, special experimental apparatus is installed in connection with Mr. Marconi's latest continuous-wave system.

A new record in long-distance wireless telegraphy has recently been established. The Pacific mail liner *Mongolia*, during a journey between the Orient and San Francisco, is reported to have succeeded in exchanging messages with Boston, U.S.A., when at a distance of 8,500 miles.

It is announced that a combine is about to take place between the German Telefunken and Goldschmidt Cos., who own the patents of the Arco and Goldschmidt high-frequency machines respectively.

A meeting of the National Telephone Co. will be held at Hamilton House, Temple Avenue, E.C., on June 25th, at 12 noon, to hear the liquidator's account of the winding-up.

The hearing of the patent infringement action between

Marconi's Wireless Telegraph Co. and the Helsby Wireless Telegraph Co. has been fixed definitely for June 23rd.

On the 22nd inst communication with Dawson City was restored.—As from the 26th inst. the Companies whose routes go *via* Madeira are charging half rates for deferred telegrams to Bolivia, and they must be written in plain Spanish, English, French, Latin, or Italian.

## ELECTRIC TRACTION NOTES

The railway from Stockholm to the charming waterside resort of Saltsjöbaden (about ten miles in length), which, although of standard gauge, is a self-contained line, unconnected with the main Swedish railway system, is to be converted to electric traction on the 1,200-volt continuous-current system. A half-hourly service is to be run instead of the present hourly service, and trains composed of one motor car, in the centre, and one to six trailers, each to carry seventy-five passengers are proposed. Each motor-car will be provided with four motors, each rated at 110 kw. on the one-hour rating, coupled permanently in pairs of two in series. Control will be by field variation. The contactors will be worked from a 65-volt circuit also used for lighting obtained from a motor-generator and a stand-by battery. The trains will be heated by a number of 3-kw. heaters in series on the power circuit, and their control switch will be actuated by the controller, so that they are only in circuit when the motors are not under current. A contact thermometer will only permit of their circuit being closed when the temperature is below a certain value. The controllers are arranged to cut current off, and to apply the brakes the driver releases his hold on the handle. The equipment will be supplied by the Allmänna Svenska Elektriske Aktiebolaget of Västerås.

The British Electric Traction Co. is able to place £50,000 to reserve as the result of its working for 1913, compared with £40,000 in the previous twelve months, to declare the dividend on the 6 per cent. cumulative preference stock, and 3½ per cent. dividend on the 7 per cent. non-cumulative preference stock.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 299. —

### ELECTRIC CLOCKS ON THE "AQUITANIA"

A COMPLETE installation of "Pulsynetic" electric impulse clocks has been fitted throughout the *Aquitania*. These clocks were manufactured by Gent & Co., Ltd. (Leicester), with whom the order was placed through Edward & Sons (92 Buchanan Street, Glasgow), their Scottish agents, and the installation was carried out under their supervision by W. C. Martin & Co. A very large number of dials are fitted, of various designs and finishes, and hardly two are alike. Several of them are old masterpieces of the horological art, which have been fitted with "Pulsynetic" movements, while



MASTER CLOCK ON THE "AQUITANIA."

the original dials and hands were retained. Notable among such instances is an old verge bracket clock fitted in the drawing-room. The master clock, or impulse transmitter, is placed in the chart room, and is fitted with a chronometer

balance. A novel and ingenious automatic advancing and retarding mechanism fitted to the master clock enables all the dials to be simultaneously corrected to ship's time daily. We understand that the principle of automatically advancing is an entirely new contrivance, and supersedes the existing cruder methods of advancing the ship's clocks when sailing eastwards. The firm has issued a special booklet on "Electric Clocks for Ship Use," of which our readers are invited to apply for copies.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**ELECTRIC IRONS.**—A leaflet from Drake & Gorham describes the "Triangle" pattern of electric flat iron.

**FITTINGS AND ACCESSORIES.**—Among new leaflets which have recently been issued by the Sun Electrical Co. (118 and 120 Charing Cross Road), are descriptions of a convenient ceiling rose combined with a switch actuated by pulling a chain, and some new fittings for half-watt lamps, both for interior and exterior lighting.

**BELL INDICATORS.**—We have received from the Sterling Telephone & Electric Co., Ltd. (210-212 Tottenham Court Road, London), a pamphlet giving particulars and sizes of their new electric bell indicators, which are made suitable for from two to thirty indicators.

**IRONS AND DOMESTIC APPLIANCES.**—In connection with their scheme for introducing the various domestic uses of electricity to consumers by means of free trials of electric irons, referred to in another column, the General Electric Co., Ltd., have issued a neat little 32-page booklet entitled "Electricity in the Home," and an idea of the cost thereof. A long range of G.E.C. heating specialties, with which our readers are already familiar, are described in well-chosen words.

### ROTARY FLOOR MACHINE

WE reproduce herewith an illustration of an electrically-driven floor machine made by The Electric Floor Machine Co., Ltd. (118 City Road, London, E.C.). It consists of a circular brush, which is rotated by a small electric motor through gearing. Several different types of brush are supplied with each machine, which can thus be used for a variety of purposes, including scrubbing, waxing, and polishing, for wooden floors, or grinding and dressing for stone or marble. The motor, which is rated at  $\frac{1}{3}$  h.p., is controlled by a switch

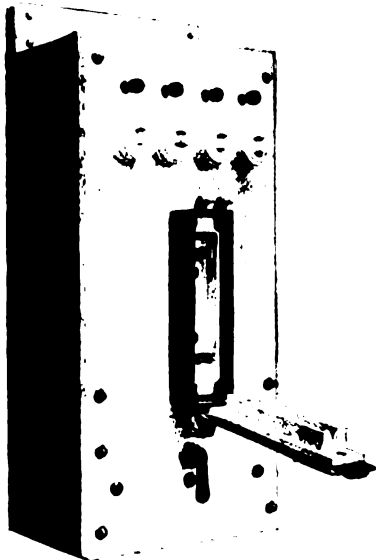


ROTARY FLOOR MACHINE.

conveniently situated on the handle of the machine, current being obtained either from a wall-plug or lamp socket. The saving in time and labour which is effected by the use of this machine is considerable. In cases where the amount of work to be done would not warrant the purchase of one of these machines, the manufacturers are prepared to quote for carrying out the work required.

### 800-VOLT LIGHTING CIRCUITS

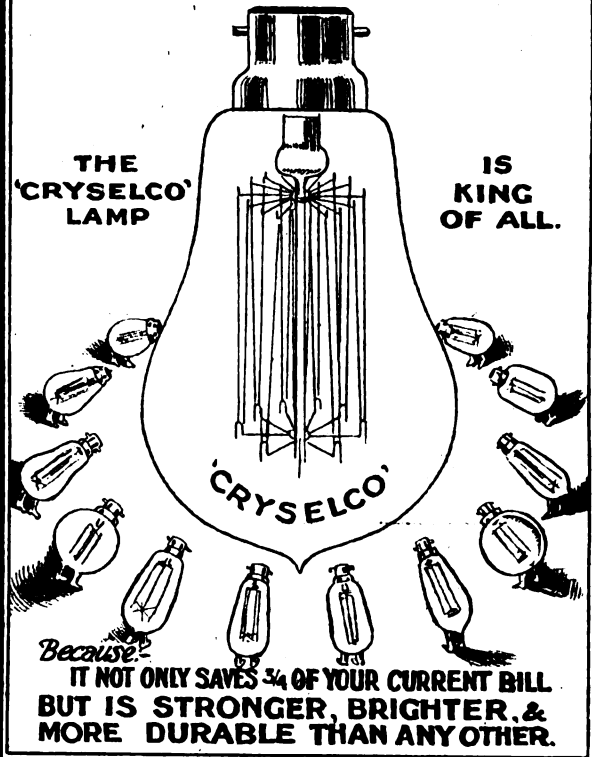
A NEW arrangement of panel, as specially constructed by A. Reyrolle & Co. (Hebburn-on-Tyne), for use in power and sub-stations on South American railways, is shown in the accompanying figure. The marble front is



800-VOLT LIGHTING PANEL.

mounted on a box-shaped frame carried on a pair of wall brackets. A change-over switch, operated from the handle shown on the bottom of the marble panel, enables the lighting supply to be taken from one or other of two sources.

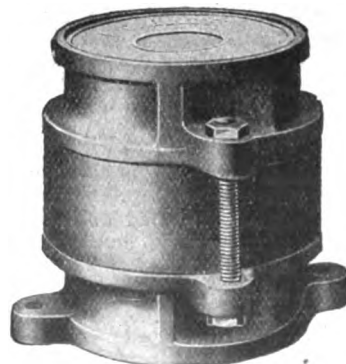
### ALL OTHERS BOW BEFORE *The* **'CRYSELCO'** METAL FILAMENT LAMP



The lid of the main fuse is so interlocked with this change-over switch that access to the terminals can only be obtained when the switch is in the "off" position, as shown on the photograph. There are four lighting circuits leading away from the top of the panel through quick-acting rotary switches in porcelain covers and fuses. The latter are of a cartridge type, provided with handles for the purpose of easy removal. The arrangement is for taking a direct-current 800-volt lighting supply from the track circuits, one pole being earthed.

### AN ALTERNATING CURRENT BUZZER

THE neat little piece of apparatus illustrated here has been brought out by the London and Rugby Engineering Co., Ltd. (10 Bush Lane, Cannon Street, E.C.), and is designed to replace both battery bells and bells supplied from alternating circuits through separate transformers. It can be used



A.G. BUZZER.

on all ordinary A.C. supply voltages, and is easily fitted and connected to any existing bell installation. The primary winding, which is connected to the supply is quite separate from the secondary, which is connected to the push circuit. There are no working parts to get out of order, nor to require adjustment.

**MICA** BRITISH MICA CO., LD.  
Contractors to  
H.M. Government,  
Lebanon Road Works,  
Wandsworth, S.W.  
Tel.—406 P.O. Putney  
Teleg.—"Micamint," London.

Plate Tubes,  
Rings, &c., in **MICANITE**

**GLASS TUBES  
AND RODS**  
FOR ELECTRICAL PURPOSES  
GUILBERT-MARTIN  
9, Edmund Place, LONDON, E.C.

**Werths & Co.**  
41, Aldersgate Street, London, E.C.  
for  
**Adhesive** and **Rubber** Tapes.

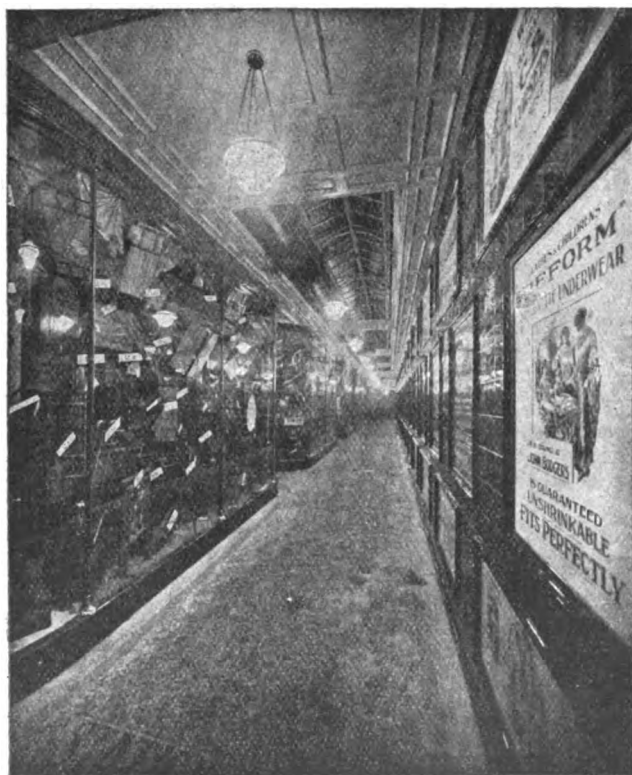
**James Macintyre & Co. Ltd.**  
Manufacturers of  
**PORCELAIN**  
**INSULATORS**  
of every  
description  
Washington Works, Burslem.

**ELECTRICAL ENGINEERING**  
List of Selected Technical Books  
**POST FREE ON APPLICATION.**  
The Kilowatt Publishing Co., Ltd.,  
203, Temple Chambers, London, E.C.

**F. WIGGINS & SONS,**  
FOR **MICA** INSULATION  
102, 103 & 104, MINORIES, LONDON.

### ARCADE LIGHTING

THE illustration which has been reproduced here has been sent us by Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston), and shows the lighting of the new Station Arcade recently opened at Ilford. This contains a number of shop windows, and is situated in the main shopping thoroughfares of Ilford. It links up the High Road with the Station Road, and is illuminated by 100 candle-power Wotan lamp units and Siemens Albalux semi-indirect fittings. The



LIGHTING AT STATION ARCADE, ILFORD.

photograph was taken by the aid of these units only, and it will be observed that the goods displayed can be seen to advantage, even without the aid of inside lighting. The fittings are artistic in appearance, and by the correct arrangement of clear and opal glass, "glare" is eliminated without much actual loss of efficiency. A booklet dealing with Albalux fittings will be supplied to any bona fide trade reader on receipt of inquiry.

**G.E.C. Novelties.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), advise us that among new lines of apparatus which they are introducing is a particularly light and handy form of grinding, polishing, or buffing motor equipment weighing only 5½ lbs., and some new patterns of switch and fuse sets, including one mounted on a varnished oak board with corner insulators and one in an interlocked iron case.

### ALABASTER DISHES

A VERY large variety of translucent reflector bowls of different materials has been placed on the market from time to time by the British Thomson-Houston Co., and one of the latest developments in this direction is the introduction of a series of real alabaster bowls for this purpose. These are cut from solid blocks of alabaster. The dishes are semi-transparent, and when used in conjunction with Mazda lamps produce a soft, diffused illumination, beautifully mellow in quality. The dishes can be had with a predominating tint



ALABASTER DISHES FOR SEMI-INDIRECT LIGHTING.

of white, red, or yellow. In no case is the colour uniform, because the surface of the alabaster is veined like marble, and there are consequently a number of different shades and colour effects in each dish. There are at present four patterns available, in various diameters suitable for use with the standard forms of semi-indirect lighting fittings. Our readers are invited to inspect these dishes personally at the B.T.H. Co.'s showrooms (Mazda House, 77 Upper Thames Street, E.C.), or to write for a copy of a new price sheet, whereon these articles are illustrated in colours.

**Domestic Uses of Electricity.**—The General Electric Co., Ltd., are conducting a special campaign towards promoting the more general use of electricity for domestic purposes. The particular aim is to obtain an entry for electricity into those houses where electric lighting is in vogue, for heating, cooking, and general power by means of the "Magnet" electric iron. To this end they have made arrangements whereby contractors, stores, and ironmongers can supply "Magnet" domestic electric irons for 15 days' free trial. By payment of 13s. 6d. the "Magnet" iron can be bought, and used as much as the purchaser desires in his own home for a fortnight, and, if at the end of that time complete satisfaction is not obtained, the purchase money will be refunded in full in exchange for the iron.

**The Strength of Metal Filament Lamps.**—A testimonial which has been received by the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), refers to a batch of 600 lamps in small parcels done up in corrugated paper, which were being conveyed by a motor-cycle side-car along a road in India, and were thrown out when travelling at 20 miles per hour without damage.

**Lamp-locking Devices.**—The "Lamlok" Co. (148 Addison Gardens, W.) inform us that they have now devised an easily operated lock for locking lamps into Benjamin china backplate holders, in response to many inquiries which had been received in that direction.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Auckland.**—Three 750-kw. D.C. mixed-pressure turbo-generators and one 1,500-kw. three-phase turbo-generator with auxiliary plant and sub-station equipment. Messrs. Preece, Cardew & Snell, 8 Queen Anne's Gate, S.W.

**Australia.**—The Melbourne City Council requires 900 yds. 7/16, and 1,600 yds. 7/14 S.W.G. concentric lead-covered cable. Messrs. McIlwraith, McEacharn & Co., Billiter Square Buildings, E.C.

**Bootle.**—A Local Government Board inquiry was held last week concerning a loan of £19,312 for electrical extensions.

**Clacton-on-Sea.**—A twelve months' supply of fittings. Town Clerk, June 3rd.

**Cleethorpes.**—A loan of £10,000 is to be applied for to carry out the extension scheme prepared by Mr. S. Vesey Brown, the consulting engineer.

**Dartford.**—One 500-kw. high-pressure steam turbo-alternator with surface condenser, pumps, air filter, transformer, &c. Borough Electrical Engineer. June 15th.

**Falkirk.**—An expenditure of £4,799 is contemplated upon an additional battery, and £1,000 upon a switchboard.

**Galashiels.**—Messrs. Balfour, Beatty & Co., on behalf of the Galashiels & District Electric Supply Co. has submitted a plan of the route of the proposed cable which it is intended to lay in connection with the electric lighting scheme.

**Horsham.**—The capacity of the storage battery at the generating station is to be doubled, at an estimated cost of £400, with an estimated extra annual maintenance charge of £28 10s.

**Huddersfield.**—The Local Government Board has sanctioned a loan of £21,500 for the purposes of the electricity undertaking.

**Kettering.**—Loans are to be taken up with the Kettering Industrial Co-operative Society to the extent of £1,000 for assisted wiring, £1,400 for mains, and £600 for services, at 3½ per cent.

**Leeds.**—A Local Government Board inquiry was held last week concerning loans amounting to £212,000 for the general purposes of the electricity undertaking. One of the items is £17,600 for the taking over of the Roundhay & District Electric Lighting Co. Mr. C. N. Hefford, Manager of the Department, said that the Roundhay consumers would have their charges reduced to half the present figures if the scheme were sanctioned.

**London: L.C.C.**—Tenders are to be invited for rotary-converters, static transformers, and an overhead crane for the tramway sub-stations.

**Hammersmith.**—An additional main is to be laid in the Goldhawk Road at an estimated cost of £1,153.

**Shoreditch.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £11,073 for mains, house services, and meters, and £11,481 for mains, transformers, and switch-gear.

**Southwark.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £10,087 for machinery, house services, and meters.

**Redditch.**—The Council has decided to adopt the scheme recommended by its consulting engineers, Messrs. Handcock & Dykes, to extend the electricity undertaking, at an estimated cost of £18,000.

**Salford.**—It is anticipated that additional generating plant will be required in the near future.

**Trebizond.**—An electric lighting concession has been granted to Osman Effendi Gurdji Zadé. The *Board of Trade Journal* states that it is probable that he will exercise his option of transferring the concession to another person or company.

### Wiring

**Manchester.**—Electric lighting at the Soss Moss Special School, Warford, Cheshire. Education Offices, June 10th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Harrogate.**—New school.

**Hitchin.**—Technical school. Architect, W. Millard, 10 Gray's Inn Square, W.C.

**Luton.**—New secondary school.

**Portsmouth.**—Elementary school, Wimborne Road. Town Clerk.

**St. Alban's.**—Additions and alterations at County Asylum. Architects, G. T. Hine & Pegg, 35 Parliament Street, S.W.

**Wolverhampton.**—Rebuilding of Theatre Royal.

### Miscellaneous

**Morocco.**—The Government of the French Protectorate in Morocco has been authorised to raise a loan which includes a provision of £440,000 for telegraphs and telephones.

**Spain.**—Two electric 5-ton portal cranes with revolving platforms are required at Huelva. Further particulars at 73 Basinghall Street, E.C.

**Warwick.**—Electric motors, centrifugal pumps, switchgear, automatic control apparatus, &c., for Longbridge pumping station. Consulting Engineers, Messrs. Dodd & Dodd, County Chambers, Corporation Street, Birmingham.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Barnes.**—An order has been placed with the Electrical Apparatus Co. for 100 meters.

**Colwyn Bay.**—An order has been placed with Messrs. Chamberlain & Hookham for meters.

**Dunedin (N.Z.).**—Messrs. Lawrence and Hanson have obtained a contract for three-phase Isaria meters.

**Edinburgh.**—A contract for C.C. meters (Bastian Patents) has been placed with the Electrical Co.

**Glasgow.**—The following are among the successful tenderers for supplies for the Electricity Department for the coming twelve months:—Meters, Chamberlain & Hookham, Ferranti, British Thomson-Houston Co.; flame arc-lamp carbons, W. Webster; ordinary arc-lamp carbons, Sloan Electrical Co.; rubber-covered cables, Craigpark Cable Co.; L.T. mains, Callender's Cable & Construction Co.; E.H.T. mains, W. T. Glover & Co.

**London: L.C.C.**—Eight firms were recently asked to tender for testing plant for polyphase meters. The Highways Committee now reports that only two of the eight firms tendered, and that the prices received were much in excess of the estimate. It is therefore recommended that none of the tenders be accepted.

**Hammersmith.**—The tender of the Armorduct Manufacturing Co. for insulated cable at £92 16s. less 2½ per cent. is recommended for acceptance. Twenty-one tenders were received, the prices ranging from the accepted tender (the lowest) to £172 15s. less 2½ per cent.

**Tunbridge Wells.**—The tender of the B.T.-H. Co. for a turbo-alternator, and that of Isaac Storey & Sons, for condensing plant, have been recommended for acceptance by the Electricity Committee.

## APPOINTMENTS AND PERSONAL NOTES

An assistant telephone engineer and a junior telephone engineer are required by the Constantinople Telephone Co. (See advertisement on another page.)

Mr. C. Bottomley Smith, Engineer to the old Hove Electric Lighting Co., has been transferred to a similar position under the Corporation since the acquisition of the undertaking.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £65 5s. to £65 15s. (Last week the same.)

**Canadian Agency.**—An electrical engineer, with a good connection throughout Canada, wishes to get into touch with United Kingdom electrical and mechanical engineering firms. The name of the inquirer can be obtained at 73 Basinghall Street, E.C.



## LOCAL NOTES

**Ashington: Peculiar Conditions of Gas and Electricity Supply.**—The proceedings on the Bill of the Ashington U.D.C., which sought to set up municipal gasworks, and was passed by a House of Lords Committee last week, revealed some peculiar conditions of the supply of both electricity and gas in the district. The Ashington Coal Co. some forty years ago started a small gasworks, but in 1902 entered into arrangements with the Northern Counties Electricity Supply Co. to supply them with electricity generated on the Coal Co.'s premises, which the Northern Counties Co. was to supply in detail to the district. The greater portion of the houses in the district belong to the Coal Co., and practically all these have been wired for electricity supply, whilst under the agreement between the Coal Co. and the Electricity Supply Co. the former bound itself not to push the sale of gas. The Northern Counties Co., however, did not prosper, and the Newcastle-on-Tyne Electric Supply Co. took the undertaking over. In 1911 the Council desired a fuller supply of gas in the district, but the Coal Co. was unable to give it under the terms of the agreement already mentioned. The result was that the Council promoted a Gas Bill, and has been successful in getting it through Parliament. The question, however, is as to what degree of success can attend this venture in view of the fact already mentioned that at least two-thirds of the houses in the district are already wired, and a further 600 are in course of being wired.

**Ashton-under-Lyne: Electrical Developments.**—In order to meet the demands upon the electricity undertaking, the Corporation has had to carry out an extension scheme costing some £38,000, which includes the installation of two turbo-alternators capable of a combined output of 4,000 kw. These two new sets were started up last week.

**Barnes: Current for Electric Vehicles.**—The Council has adopted the scheme of the Electric Vehicle Committee given on p. 202 of our issue for April 9th.

**I.M.E.A.**—The Borough Electrical Engineer is to attend the I.M.E.A. Convention in June, and will be allowed a first-class railway fare and a guinea a day for expenses.

**Birmingham: Increased Electricity Profits.**—The annual accounts of the Electricity Supply Department are the most satisfactory ever yet presented. The net surplus is nearly £45,000, of which £25,000 has been placed to renewals, and in conjunction with the balance brought forward from the previous year, the sum of £25,000 is transferred to relief of rates.

**Kingstown: Gas Co.'s Keen Opposition.**—Since the Kingstown electric lighting Order was passed by a House of Commons Committee (ELECTRICAL ENGINEERING, May 7th, p. 264, May 14th, p. 276), the Dublin & Alliance Gas Consumers' Co. has been very persistent in its opposition, and has succeeded in getting several Members of Parliament to block the further passage of the Bill on third reading. As we mentioned at the time the Bill was before the Committee, the Gas Co. endeavoured to secure the insertion of the "Northumberland" clause, in the event of the Order being taken over by the Council, and it is now stated that a modification of the "Northumberland" clause has been inserted in the Bill with general approval, and that it will now go through its further stages without opposition. The first period of the revision of prices is to be after the fifth complete financial year.

**Leeds: Electricity Profits.**—There was a net profit of £14,314 upon last year's working of the electricity undertaking, a decrease of £1,193 over the previous twelve months. Arrangements are in hand for the installation of a 1,200 kw. turbo-generator, and an agreement has been made for the purchase of a large quantity of land in South Accommodation Road for the storage of coal. The site is also regarded as a suitable one for the erection of a new power station when necessity arises.

**London: Hackney: Electric Vehicle Charging.**—In connection with the recommendations of the Electric Vehicle Committee (ELECTRICAL ENGINEERING, April 9th, p. 202) the Electricity Committee recommends that for energy supplied to ordinary consumers from a circuit which is used solely for charging the batteries of electric vehicles, and from which the Council reserves the right to cut off the supply between 4 p.m. and 7 p.m. in October, November, December, January, and February, the charge be 1d. per unit, whilst during the hours of 4 and 7 p.m. in these months the charge be 3½d. per unit. In the case of energy sold to garage proprietors who provide the facilities of charging, a rebate of 20 per cent.

on these charges be made in order to allow current to be supplied retail at the above prices.

**Fulham: Street Lighting.**—The Electricity Committee recommends that an expenditure of £271 10s. be authorised upon the conversion of 100 gas lamps along the lines of electricity mains.

**Islington: Guardians and Electric Lighting.**—A Local Government Board inquiry was held at the Guardians' Offices last week, with regard to a loan of £3,600 for an electrical installation at the Guardians institutions and offices. This matter has given rise to considerable controversy as between the Electricity Committee and the Gas Co., who were represented by Mr. A. Colefax, K.C., whilst the case for electricity was supported by Mr. A. Gay, the Borough Electrical Engineer, and Messrs. Handcock & Dykes, the Consulting Engineers. Mr. F. W. Goodenough gave evidence for the Gas Light & Coke Co. The Council has quoted a flat rate of 2d. per unit, and the intention is to enter into an agreement at this price with a minimum of 125,000 units per annum for a period of five years. Mr. A. H. Dykes estimated that the annual cost of lighting would be £852, and put the figure for gas at £1,348. On the other hand, Mr. F. W. Goodenough said that the cost of gas would be £1,035 including maintenance, and repayment of cost of installation in fifteen years, and with a total candle-power of 100,000. Taking electricity at 2d. per unit, he said it would cost £1,536 to provide 100,000 c.p., whilst with maintenance charges, &c., the total figure would be £2,285.

**Nelson: Extension of Area.**—A seven years' agreement has been made for the supply of electricity in Brierfield.

**Saddleworth: Bulk Supply from Oldham.**—The question of giving a supply in this district is under consideration by the Oldham Electricity Committee.

**Stockton: Economy of Bulk Supply.**—The question of whether it would not pay the Council to increase the quantity of current taken from the Cleveland & Durham Power Co., and to reduce the quantity generated itself, has been raised by one or two councillors. This does not seem to meet with general approval, but more may be heard of the matter later.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &amp;c.

**R. Waygood & Co.**—The provisional agreement with the Otis Elevator Co., of New Jersey, under which Messrs. Waygood will acquire the entire interest of that Company in the Otis Elevator Co. of London, with which it will be amalgamated, has been sanctioned at an extraordinary general meeting.

**Lancashire Power Construction Co.**—At the annual meeting of the company last week some strong criticisms were passed upon the action of the Board of Trade in allowing the Bury Corporation to supply the Heywood U.D.C. in bulk. Heywood is in the Lancashire Power Co.'s bulk supply area, and, acting on the advice of Mr. H. Lloyd, K.C., the directors feel they must resist to the fullest extent, not so much as regards the prejudicial effect of the Bury-Heywood agreement, but with a view to preventing a similar thing happening in other parts of the company's area. One effect of the arrangement between Bury and Heywood would be that districts in the power company's area beyond Heywood might be deprived of a supply, since, without the Heywood supply, the cost of mains to reach these other areas would be excessive.

**B.T.H. Co.**—Mr. J. F. Nauheim, presiding at the annual meeting last week, said that although the past year had been a very satisfactory one, the directors thought it the wisest policy to make use of the profit to further strengthen the position in view of the fact that during the year they will again be spending large sums for the completion of buildings now under construction. The accounts given in our issue of May 14th, p. 276, were adopted.

**STAMPING**

**A.E. HARRIS & CO.**

**FOR ELECTRICAL TRADES**

95, CAMDEN ST. BIRMINGHAM.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 388 [VOL. X., No. 2]  
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THURSDAY, JUNE 4, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

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OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

### SUMMARY

SOME further details as to the standardisation of electric charging plugs, batteries, etc., have been agreed upon by the Electric Vehicle Committee. (Page 302.)

THE electrical equipment of the L. and N.W. Rly. line from Earl's Court to Willesden is described in an illustrated article. (Page 303.)

THE B.E.A.M.A. has adopted the Institution of Electrical Engineers' Model General Conditions of Contracts. (Page 304.)

SIR JOSEPH SWAN, the pioneer of the incandescent lamp, died on Wednesday of last week at the age of eighty-six. (Page 305.)

MR. A. BRUCE ANDERSON, Managing Director of Ferranti, Ltd., was among those who perished in the disaster to the *Empress of Ireland*. (Page 305.)

A PAPER by Mr. A. P. Trotter read at the last meeting of the Illuminating Engineering Society discussed certain definitions of photometric quantities proposed by an American Committee. (Page 305.)

SOME very promising experiments on the production of steel direct from ores in the electric furnace were described in a paper by E. Humbert and A. Hethey read recently before the Iron and Steel Institute. (Page 306.)

A 300-kw. three-phase arc furnace is in use in Toronto for the production of high-quality steel from ore fines. (Page 306.)

A SYSTEM of drying the air for blast furnaces by electrically-driven refrigerators has been introduced with success. (Page 306.)

A SELF-CONTAINED generating plant for supplying lifting magnets in use on steam cranes is described. (Page 307.)

AMONGST the Patent Specifications published in May were some of interest to mining electrical engineers, dealing with safety lamps, winding motors, and a rock drill. Some others relating to the manufacture of tungsten and aluminium nitride and the construction of electric furnaces should be of metallurgical interest. (Page 308.)

PARTICULARS are given in our "Electric Traction Notes" of recent developments in three-phase working on the Italian State Railways. (Page 308.)

A BILL has been introduced giving effect to the wireless recommendations of the International Convention for Safety of Life at Sea. Successful tests of the German Transatlantic stations on the Goldschmidt system are reported. (Page 308.)

THE effect of change of frequency in alternating-current meters is discussed in our Questions and Answers columns. (Page 309.)

SOME of the Patents published last week deal with regulation of A.C. generators, manufacture of half-watt lamps, electrolytic furnaces, and wireless telegraphy. The half-watt lamp patent is the fundamental patent for nitrogen-filled lamps. A patent for an electric furnace expires this week after a life of fourteen years. Opposition to grant of a telephone patent has been entered. (Page 310.)

OUR Trade Section contains descriptions of an electric salvage pump, an electric alarm lock, and a new form of large electric bell. (Page 312.)

NEW plant is required at Stalybridge, Harrogate, Atherton, Wrexham, Sunderland, Colne, Australia, and South Africa; a number of common battery telephone switchboards are required in Australia; electrical stores at Colchester; and tramcars by the L.C.C. and at Darwen. (Page 313.)

RECORD years are reported by a number of municipal electricity departments.—Mr. J. F. C. Snell has been called in to report as to the general condition of the Belfast electricity undertaking.—The Bexhill Council has refused permission to one of its electrical officials to act as a consulting engineer in his private capacity.—A large electric cooking apparatus has been installed at the new Tower dining room, Blackpool. (Page 314.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JUNE 4TH.

*Institution of Mining Engineers.*

- 11 a.m. At Burlington House, Piccadilly. "Development of the Internal Combustion Engine for Power Generation at Collieries," by J. Davidson.

*Royal Institution.*

- 3 p.m. Lecture I., by Prof. S. P. Thompson, F.R.S., on "Faraday and the Foundations of Electrical Engineering."

TUESDAY, JUNE 9TH.

*Institution of Electrical Engineers: Scottish Section.*  
Annual Summer Outing to Arran.

THURSDAY, JUNE 11TH.

*Royal Institution.*

- 3 p.m. Afternoon Lecture II. "Faraday and the Foundations of Electrical Engineering," by Prof. S. P. Thompson, F.R.S.

FRIDAY, JUNE 12TH.

*Physical Society.*

- 8 p.m. At Imperial College of Science, South Kensington, S.W. (1) "A Magnetograph for Measuring Variations in the Horizontal Intensity of the Earth's Magnetic Field," by F. E. Smith. (2) "The Atomic Weight of Copper by Electrolysis," by A. G. Shrimpton. (3) "Note on an Improvement in the Einthoven String Galvanometer," by W. H. Apthorpe.

**The London Electrical Engineers.**

Headquarters (46 Regency Street, S.W.) open Sats. till noon.

*Rating Exam.* for all Cos. from 7 to 10 p.m. every Wednesday.(TO-DAY) THURSDAY, JUNE 4TH, *C. Co.* FRIDAY, JUNE 5TH,*D. Co.* MONDAY, JUNE 8TH, *A Co.* THURSDAY, JUNE 11TH,*C. Co.* FRIDAY, JUNE 12TH, *D. Co.*

SAT., JUNE 15TH. Annual Course of Musketry all Companies, Purfleet. Miniature Range and Technical Instruction each evening.

**Electrically-driven Barges.**—It has been decided to start a service of electrically-driven barges on the River Hudson next autumn. The boats, which will be 276 feet long, beam 40 feet, with a deep-loaded draft of 6 feet, will be fitted with a turbo-generator, which will supply power to three 75 h.p. motors, which will be direct coupled to three propellers. It has been calculated that the cost of carriage with these barges will work out to about 10d. per ton, as against 3s. per ton when steam tug and fleet of barges are used.

## ELECTRIC VEHICLES

At a meeting of the Electric Vehicle Committee held in Birmingham on May 22nd, sample charging plugs, fitted with earth connection contacts, were inspected, and a particular design was selected for standardisation. Further consideration was given to the method of gripping the flexible cable to the plug and the connecting of the earth wire to the plug shell, but final decision in these matters was deferred. As to the position of the plug receptacle on the vehicle, it was decided to recommend that it should be fixed under the driver's seat, preferably with the plug pointing upwards so as to make it impossible for the driver to take his seat without noticing that the charging connection is attached to the vehicle. It was also decided to recommend that the fixed receptacle in the garage, for taking the charging connections, should be placed in an accessible position, preferably horizontal. As to polarity, it was decided that the centre contact of the plug should always be the negative. This is the standard arrangement adopted by the Electric Vehicle Association of America. On the question of battery plates, a communication was read from the Secretary of the B.E.A.M.A. stating that the accumulator manufacturers' section of that Association had decided to recommend for standardisation a plate for electric vehicle batteries having dimensions of 8½ in. x 5½ in., with lug centres 4½ in. It was further reported that the accumulator manufacturers have under consideration standardisation in the sizes of the cells. As to tariffs for charging electric vehicle batteries, the Secretary reported that up to date 51 municipal electric supply undertakings and three company undertakings had agreed to a rate of 1d. per unit or less for "off peak" charging. Some of these undertakings had come into line upon the whole of the Committee's recommendations in regard to tariffs. The Committee decided that they must be in possession of at least £200 for carrying on the work up to the end of next December. Amounts totalling 35 guineas were promised at the meeting, and the Secretary was instructed to approach the principal municipal owned electric supply undertakings and others with a view to obtaining contributions towards such a fund. With reference to the demonstration of electric vehicles which is being arranged to take place at Birmingham on June 16th in connection with the I.M.E.A. Convention, the Secretary reported that five firms were arranging to send one or more vehicles each.



## EXTRACT FROM LETTER RECEIVED BY A FIRM OF MANUFACTURERS:—

"My electrician informs me that whenever he turns the handwheel provided on the dynamo to regulate the pressure, the corrugated copper drum on the shaft catches alight, and he is unable to extinguish it by the ordinary means."

## LONDON AND NORTH-WESTERN RAILWAY ELECTRIFICATION

WE have already referred to the conversion to electric traction of the section of the London and North-Western Railway between Willesden Junction and Earl's Court, and we are now able, through the courtesy of Mr. F. A. Cortez-Leigh (Electrical En-

They were supplied by Messrs. H. J. Skelton & Co., and made by the Cargo Fleet Iron & Steel Co. (Middlesbrough). They are supported on porcelain insulators of the pattern shown in Fig. 1, attached to the sleepers by malleable iron clips. Special anchor insulators, also shown in Fig. 1, are provided at intervals. The insulators have been supplied by Messrs. Doulton & Co. Each rail-joint is bonded by four copper bonds of the flexible strip type, the four bonds together having a sectional area of 1'4 sq. in. The bonds have been supplied by the Forest City Electric Services Supply Co., of Salford. The bonds have solid drop forged heads, and were fixed into the rails by hydraulic pressure. The trailing ramps are of cast-iron, and the leading ramps on the through lines are of forged steel, and in some cases, as on sidings, of special cast-steel. The jumper cables for connecting the several sections of the rails together at cross-overs, &c., are of Messrs. W. T. Henley's Telegraph Works Co.'s make, and are laid solid in bitumenised fibre troughs, and fitted with

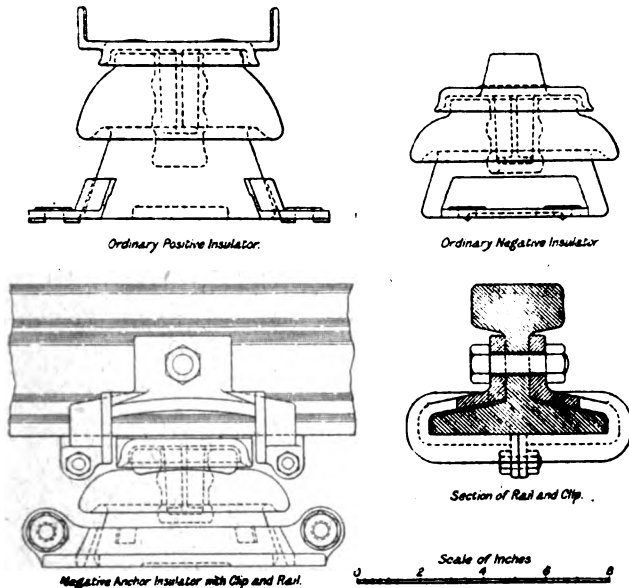


FIG. 1.—ORDINARY AND ANCHOR INSULATORS.

gineer to the L. and N.W. Rly.), to give some further details of the equipment of the line which is already working, as well as of the further work in hand on the railway. At present the electric service merely replaces the old steam service, and pending the completion of the company's own power station at Stone-

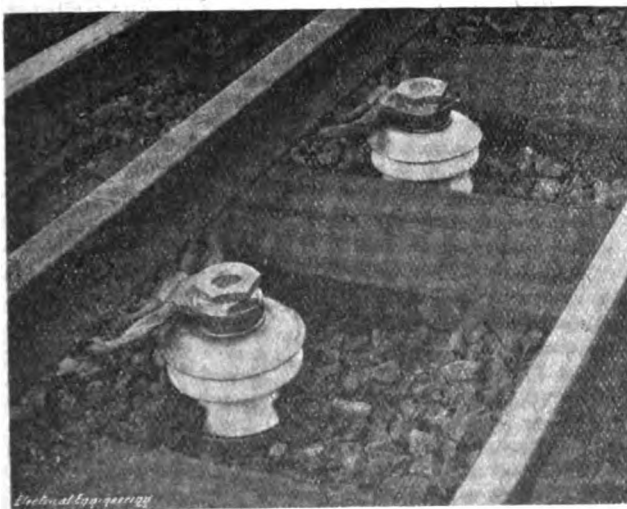


FIG. 2.—SEALING TERMINALS.

bridge Park, current is obtained from the G.W. and District Railway Companies' sub-stations.

The track equipment is generally similar to that of the District Railway; the track voltage is about 600. The conductor rails are of special low carbon soft steel, weighing 105 lb. per yd., of the following composition:—Carbon, 0'044;

Mr. Cortez-Leigh's patent sealing terminal. This terminal is illustrated in Fig. 2, and forms an effective seal to the insulation of the cable, and at the same time prevents damage to the cables, due to mechanical shocks and vibration. The feeder and sectionalising switch-pillars are also being provided by Messrs. W. T. Henley's Telegraph Works Co.; a photograph of one of these pillars is shown in Fig. 8.

For a start, four three-coach trains—motor-coach, trailer, and control trailer—are being provided by the Metropolitan Railway Carriage, Wagon & Finance Co., but owing to these not being ready, the service was commenced with rolling stock lent by the District Railway. These vehicles will be supplied with end doors and through communication. A plan showing the seating arrangements is given in Fig. 4. The control gear is placed in a steel compartment at the front end of the motor-coach. The motor-cars will have four motors of 240-h.p., each carried on bogie trucks of specially strong design. The control equipment will be of the multiple unit system with automatic features, including a Dead Man's Handle. Automatic quick-acting air-brakes and the usual

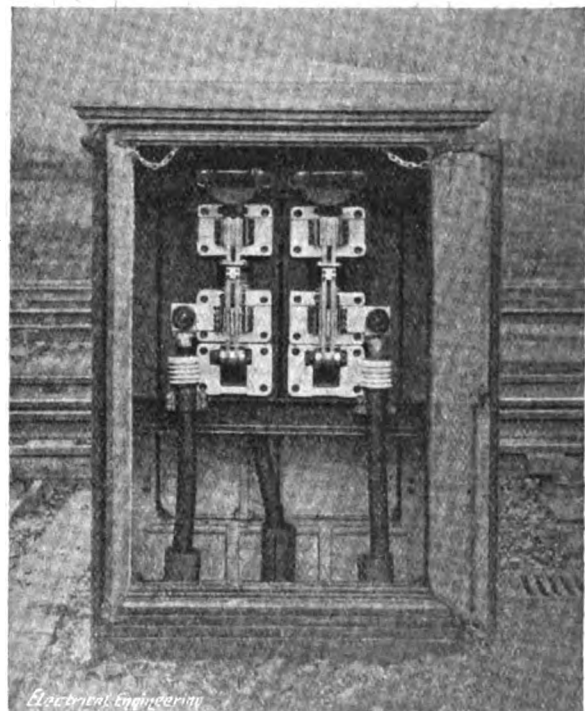


FIG. 3.—FEEDER PILLAR.

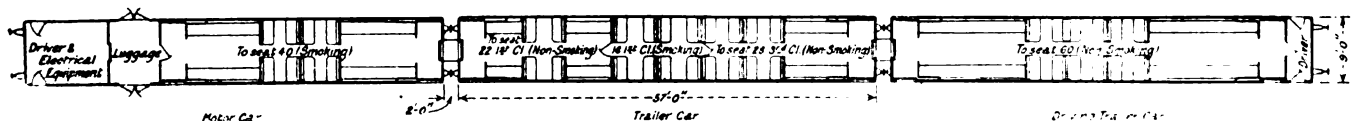


FIG. 4.—PLAN SHOWING SEATING CAPACITY OF STANDARD 3-CAR TRAIN.

manganese, 0'189; silicon, 0'080; phosphorus, 0'011; sulphur, 0'029; nickel, 0'255 per cent. The volume resistivity of the rails is approximately six-and-a-half times that of copper.

hand-brakes will be provided. Two of the trains are fitted with air compressors of the Westinghouse Co.'s make, and the other two with the Knorr Brake Co.'s rotary slide-valve

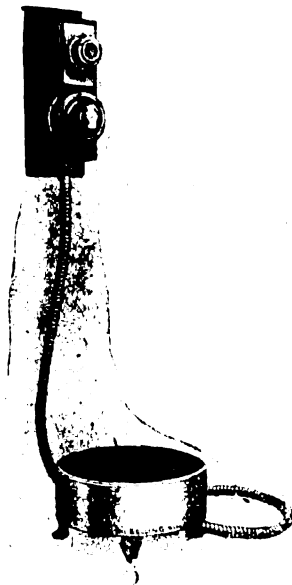


# BELLING NEWS

## Our New Boiling Ring

We are glad to say that, after many and various troubles, we are now getting well into swing with these, and can recommend our single heat ring with confidence.

In construction it is quite unique, and its introduction marks probably the most striking advance in the design of white hot electric cooking apparatus of modern times.



We have to particularly thank many engineers who have assisted us by testing and making suggestions in connection with the first 100 odd samples we sent out, as otherwise it would have been impossible for us to so quickly ascertain and put right the weak spots which were found.

## BELLING & CO.

Cooking & Heating Specialists,

EDMONTON, LONDON, N,

compressors. The main electrical equipment for these trains is being supplied by Siemens Bros. Dynamo Works.

The power-house at Stonebridge Park is nearly ready for the machinery, which will include five Westinghouse turbines driving Siemens three-phase 11,000-volt 25-cycle alternators, and B.T.H. high-tension switchgear. The auxiliaries will be driven by alternating-current motors (supplied either from the main generators through step-down transformers, or from a low-tension turbo-generator set used also for lighting, &c.), except the condenser air-pumps, which will be driven by small steam turbines. In the boiler-house there will be twenty Babcock & Wilcox boilers, with drop-link automatic stokers, super-heaters, and Green's economisers. They will be arranged in two rows with a separate chimney stack for each row. Coal- and ash-handling plant will also be supplied by Babcock & Wilcox, and will include two tray-conveyors for bringing the coal from a large coal storage ground at the end of the power-house site, and two bucket conveyors for elevating coal to the top of the boiler-house and conveying it to the bunkers. A pneumatic system is being adopted for dealing with ashes and soot. The site is of sufficient area to allow of the plant capacity being more than duplicated, and the coal storage will accommodate a supply of some 20,000 tons of coal, all of which can be handled mechanically. In addition, a considerable extra quantity can be stored in the immediate vicinity should occasion arise.

The scheme will involve eleven sub-stations, at Bushey, Headstone Lane, Kenton, Willesden Junction, Queen's Park, West End Lane, Chalk Farm, Dalston, Broad Street, South Acton, and one at the power-house. In each sub-station there will be three B.T.H. six-phase rotary converters, nine single-phase static transformers, a large storage battery, and an automatic reversible booster. The converting units are to be .750 kw. and 1,000 kw., with a large overload capacity, the machines being of self-synchronising type. The transformers will be of the British Electric Transformer Co.'s oil-cooled type, and a contract for the high and low tension switchgear (107 H.T. panels and cubicles, and 140 L.T. panels and accessories, involving a cost of between 50 and 60 thousand pounds), has just been let to the British Westinghouse Co. The high-tension cables will be of three-core, paper-insulated, lead covered, and armoured, supplied by the British Insulated & Helsby Cables, Ltd. In the case of trains to be used on the main electric system, the first consignment of motor-cars are being built by the Metropolitan Railway Carriage, Wagon & Finance Company, and the trailers at the London & North Western Railway Co.'s works at Wolverton. The electrical equipment for these trains is being constructed by the Maschinenfabrik Oerlikon, the general scheme being similar to that of the Willesden-Earl's Court stock.

**The I.E.E. General Conditions.**—The text of the Model General Conditions of Contract, issued by the Institution of Electrical Engineers (see *ELECTRICAL ENGINEERING*, May 7th, page 259), was formally adopted by the Council of the B.E.A.M.A. at a meeting held on May 21st; and, as a consequence, will be used by members (in substitution for the Association's Conditions) in connection with tenders to municipalities, district councils, public authorities, and in respect of all publicly advertised contracts where full general conditions are issued.

**Institution of Electrical Engineers.**—The following is the result of the ballot for new members, and the transfer of members from one class to another, at the annual general meeting on May 21st. *Members:* J. Juttke, W. C. Laidler, F. R. McBerty. *Associate Members:* J. Ashworth, J. V. Levett, A. Franks, R. F. Gill, A. T. Hore, H. B. Taylor (Lieut.-Com. R.N.), E. E. Tipper. *Associates:* C. W. von Roemer, F. H. Wilkins, F. W. Willcox, W. R. Day, W. J. Mountain. *Graduates:* J. W. Alexander, W. F. Andrews, L. W. Barsdorf, F. C. Davies, W. Hull, J. A. Lloyd, J. Lythgoe, E. H. Manly, H. F. Rouse, W. L. Shand, W. H. Sherwin, A. S. Tyler, C. H. Woodward, C. F. Bailey, A. C. Bostel, W. R. Dainty, E. C. Ives, R. G. Jones, H. Metcalf, W. S. Sawtell, W. J. Shaw. *Students:* A. E. Crampton, H. M. de Withmann, N. V. Foote, A. Howarth, J. H. J. Lewis, G. Ross-Bain, H. G. Seagrave, A. R. Tabor, C. J. Trutch, C. Germann, F. N. Linstow, E. F. Kill, H. J. Stone, H. S. Tilson, C. Vowell.

*Candidates transferred from Associate Member to Member:* W. G. MacMuldrow, G. S. Thorne, G. F. Allom, P. Cordiner. *From Associate to Associate Member:* E. J. Jennings, J. D. Morgan. *From Graduate to Associate Member:* A. A. Stone, T. J. Nelson. *From Student to Associate Member:* E. Hutchison, E. H. Woodward, A. M. Doig. *From Student to Graduate:* T. J. Hornblower, A. Plowman, J. P. Rowell.

**The Physical Society.**—An excursion to Cambridge has been arranged for June 20th. Visits will be paid to the Cavendish Laboratory at the invitation of Sir J. J. Thomson, F.R.S., and to the works of the Cambridge Scientific Instrument Co.

**Electrical Exhibition at Bradford.**—The British Electrical and Allied Manufacturers' Association has given permission to its members to exhibit at the Electrical Exhibition to be held by the Bradford Corporation from October 6th to 24th of this year.

## OBITUARY

JOSEPH WILSON SWAN.

THE death, on Wednesday of last week, of Sir Joseph Swan, severs a link with the early days of electrical engineering, and removes a leader in electro-chemical research who was a venerable figure in the scientific world. His life was peacefully ended at his residence at Warlingham, Surrey, at the advanced age of eighty-six.

The son of an inventor of marine appliances of considerable ingenuity, Joseph Wilson Swan was a native of Sunderland, and his early training led him into chemical pursuits. He was first an apprentice to a firm of chemists in his native town, and afterwards joined Mr. John Mawson's chemical business, ultimately, in 1860, becoming his partner, as well as his brother-in-law, and the firm assumed the well-known name of Mawson and Swan. He was fascinated by the work of the early pioneers of photography, and his personal chemical researches were soon directed into such channels. His name is well known in connection with his improvements in both collodion and dry plates, as well as in the inception of the bichromatised gelatine processes which form the basis of nearly every photo-mechanical method.

To most of our readers, however, Swan's name is, perhaps, more of a household word in connection with his work on the carbon filament lamp, a subject which had fascinated him since the age of seventeen, when he saw some of the earliest platinum-iridium lamps of Staitte. After considerable experimenting, he succeeded in producing, as early as 1860, lamp filaments from carbonised paper, but it was not till about 1880 that he perfected his lamp with a parchmentised cotton thread filament in a high vacuum produced by a mercury pump. This was in turn superseded by filaments squirted from a cellulose solution, and afterwards carbonised, a process similar to that in use at the present day. About the same time, however, Edison, working independently in America, conceived similar ideas as to the construction of carbon lamps, and, unfortunately, much money was wasted on questions of priority and commercial rivalry. Ultimately, however, in 1883, an amalgamation of the hitherto contending interests took place, and the Edison and Swan United Electric Light Co. was formed, which for many years held the sole rights for the manufacture of carbon filament lamps in this country. Sir Joseph Swan remained a director of this firm until quite recently.

Another branch of electro-chemical research in which Swan distinguished himself was in the manufacture of lead accumulators, in connection with which he took out important patents for the construction of cellular pasted plates. He also worked a good deal at the electro-deposition of metals, and devised a method for drawing wire direct from copper, deposited at a great speed with a very high current density. Various other electro-chemical manufacturing processes claimed his attention, including the manufacture of cyanides from atmospheric nitrogen.

He was one of the really great men in the vanguard of electrical progress, but his ability was recognised in France, where he was made a Chevalier of the Legion of Honour in 1881, sooner than at home. He was elected a Fellow of the Royal Society, in 1894, and received the Society's Hughes medal in 1904, in which year he was knighted. It is interesting to note that, in company with Lord Kelvin and Dr. Henry Wilde, he was an honorary member of the Institution of Electrical Engineers, of which he had been President in 1898. He had also been president of the Faraday Society and of the Society of Chemical Industry. At his funeral on Saturday, the Institution of Electrical Engineers was represented by Prof. G. Carey Foster, F.R.S., Col. R. E. Crompton, C.B., Mr. J. Swinburne, F.R.S. (Past Presidents), Mr. J. E. Kingsbury (member of Council), and Mr. P. F. Rowell (secretary).

A. BRUCE ANDERSON.

The disastrous wreck of the Canadian Pacific liner *Empress of Ireland* in the St. Lawrence River last week leaves the electrical industry the poorer by one of its most capable business men. We refer to Mr. A. B. Anderson, Managing Director of Ferranti, Ltd., who was a passenger by the ill-fated liner, and is not on the list of those saved. Mr. Anderson had been on a business tour in Canada, and was returning home. He was forty-four years of age, and leaves a wife and three sons, the two eldest of whom are at school.

Mr. Anderson joined Mr. S. Z. de Ferranti as accountant in 1892, and remained with the firm during the reconstruction after the removal to Hollinwood in 1897. He gradually rose to be General Manager, and was appointed Managing Director in 1908. He had a strong personality, being a keen business

man and firm of purpose. He was also an ardent Tariff Reformer, and took some interest in political matters in Manchester. Last year, when the firm's head office was moved to London, Mr. Anderson came to live in town permanently. In 1912 he was elected an Associate member of Council of the Institution of Electrical Engineers, and still had another year of office to serve. Another direction in which his energies were directed with great success was in connection with the formation of the British Electrical and Allied Manufacturers' Association. In this he took a leading part, and was Chairman of the Council of that body.

## PHOTOMETRIC NOMENCLATURE

A PAPER by Mr. A. P. Trotter, read on May 21st before the Illuminating Engineering Society, discussed certain suggestions regarding photometric nomenclature contained in an American report by Prof. Blondel, Dr. Kennelly, Dr. Rosa, and Prof. Sharp. This Committee chose "luminous flux" as the fundamental quantity, and not, as might appear more natural, "candle power." The latter is defined as "luminous intensity expressed in candles," and luminous intensity is defined as the solid angular density of the luminous flux emitted by the source in the direction considered, or it is the flux per unit solid angle from that source. Mr. Trotter remarks that the term "candle-power" is used in two senses. In one sense it connotes an abstract idea like area or pressure, and in the other it is a vector quantity, and denotes a definite physical magnitude. In the former sense it is synonymous with "luminous intensity," but has taken such a hold on the English language that it is difficult to get rid of it. In the latter sense, the name of the physical unit of luminous intensity, the "candle," may often be substituted for "candle-power."

Mr. Trotter thinks that the expression intensity deserves some consideration before adoption, and rather objects to the definition of candle-power as a solid angular density. The American Committee defines illumination on a surface as the luminous flux-density over that surface, or flux per unit of intercepting area—and the definition of the unit, "Lux," a unit of illumination equal to one lumen per square meter," sends us wandering over the definition of flux-density and its unit—"Lumen—the unit of luminous flux, equal to the flux emitted in a unit solid angle (steradian) by point source of one candle-power." To this is added a footnote, "A uniform source of one candle emits  $4\pi$  lumens." Mr. Trotter criticises these definitions severely, considering them unintelligible, and objecting to the introduction of  $4\pi$ , and holding that the lumen should be a derived and not a fundamental unit. It is proposed to call a lumen per square meter a "phot," with a practical unit of a milli-phot (1 ft.-candle = 1.076 milli-photos). The name "exposive" is suggested as the product of illumination of time, and the "phot-second" as the unit. The term "brightness" has two senses—emissive brightness of a source of light, and reflective brightness of an illuminated surface. The American definitions refer only to the former, and measure it in candles for square centimetre. Various other definitions were quoted in the Paper without criticism, and in conclusion some of the symbols used in different countries for photometric quantities were reviewed.

In the course of the discussion, Mr. C. C. Patterson (National Physical Laboratory) defended the use of candle-power supply as a numerical value, and the treatment of luminous flux as the fundamental idea. He also suggested the term luminous capability in place of luminous intensity. Mr. H. T. Harrison and Mr. K. Edgecumbe, however, agreed with Mr. Trotter's view. A number of other members also spoke.

**Electric Cars at the Motor Van Parade.**—At the eighth annual Parade of Commercial Motor Vehicles held by the Commercial Motor Users' Association on Monday, a slightly larger proportion of electric cars took part than on previous occasions. Out of the total of 508 entries this year, 13 were electric vehicles, as against 5 out of 372 last year, and none in previous years. A special prize was this year offered to drivers of Edison battery vehicles. The whole of the electric cars entered were driven by these batteries, and of them three were entered by Edison Accumulators, Ltd., and the remainder by Harrods, Liberty's, and Lyons. One Tilling-Stevens petrol-electric mail van was entered by T. Tilling, Ltd.

**The San Francisco Engineering Congress, 1915.**—A special section of this Congress, which is to be held at San Francisco on Sept. 20th to 25th, 1915, is to be devoted to materials of engineering construction. The subject matter is divided up into specialised divisions, several of which will interest electrical engineers.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Published on the First Thursday of each month

### THE PRODUCTION OF STEEL DIRECT FROM ORE IN THE ELECTRIC FURNACE

A PAPER by E. Humbert and A. Hethey, submitted to the recent meeting of the Iron and Steel Institute, described a series of experiments on the direct production of steel from Swedish and other ores in a 6-ton Héroult single-phase arc furnace. The energy consumed varied from 2,459 to 2,862 kw.-hours per ton, and very satisfactory qualities of tough steel were produced. The authors come to the conclusion that with the aid of the modern electric furnace the economic manufacture of steel direct from ore is a practical possibility. The material produced will, they say, be superior to that manufactured by present methods. A special type of furnace will probably be developed, although the standard Héroult furnace is satisfactory for occasional charges. The charge should lie deep in the furnace, to permit violent ebullition of the bath without overflowing. Anthracite electrodes will probably be found most satisfactory, owing to their freedom from breakages. The best use for this process will be found in countries that possess readily available sources of water-power and where deposits of pure rich ores can be obtained. Its most useful sphere will probably be found in making high-grade steels for springs, drills, and similar tools, shafts, and all grades requiring exceptional toughness. Such a process has the economic advantages of one operation instead of several, one furnace instead of a large and complicated plant; simplicity, cleanliness, and ease of control; ability to use refractory and richer ores; freedom of the steel from impurities; speed of manufacture. General cost depends largely on cost of electric power, but will be cheaper than the electrical production of steel from pig-iron; less labour, and efficient control of quality of steel obtained.

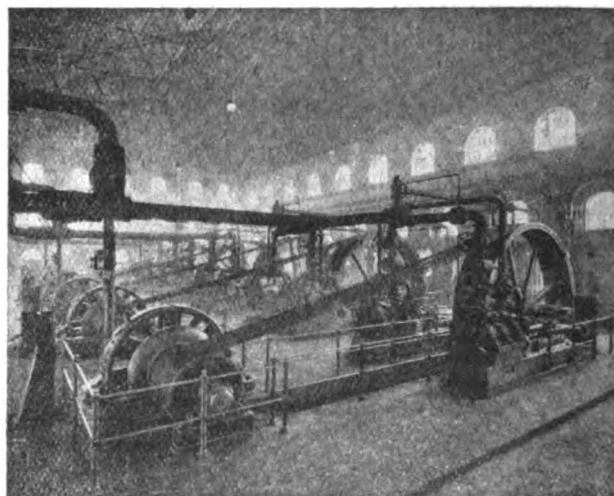
### A THREE-PHASE ARC FURNACE IN CANADA

A SOMEWHAT new design of three-phase arc furnace of 300-kw. capacity is being used by a new Toronto Company, known as Moffat-Irving Electric Smelters, Ltd., and is said to yield a high grade steel from ore fines, a waste product of blast furnaces. The crucible is built on a substantial base of concrete, says *The Electrical News* (Toronto), while above this hard burnt red bricks are used, and finally the main body is built up of silica brick. The ore, in a finely divided state, is fed into the upper portion of the furnace by a mechanical screw feed. Limestone is similarly fed in at the same level, and the necessary carbon is fed in at the bottom of the stack, which is enlarged at the bottom to form the reducing chamber proper. By this arrangement the ore and lime fall several feet through carbon monoxide gas at a temperature over 2,000° F., and as a result over 80 per cent. of the ore is reduced and the carbon dioxide escapes at the top. The furnace is run in the neighbourhood of 70 volts, so that the current is 2,500 amperes is required. The pressure can be varied about 20 per cent. up or down, according to the stage of the reduction. Regulation of the electrodes, which are of graphite 5½ in. in diameter, is effected by hand. Content analyses and physical tests have been made, and show the following composition of the steel: silicon, 0.27; manganese, 0.70; carbon, 0.29; phosphorus, 0.31; sulphur, 0.31. The physical tests yielded a 27.5 per cent. elongation on a 2 in. bar; elastic limit, 52,000 lb. per sq. in., and ultimate tensile strength, 78,000 lb. per sq. in.

**Ignition of Gas by Sparks.**—Mr. Sydney F. Walker writes in connection with the Senghenydd report that, as the result of experiments made in the earlier days, he takes the view that it is not a spark *per se*, nor a particular voltage that ignites gas, but the delivery of a certain quantity of energy either as a spark or in a heated wire or other way which causes ignition, and he mentions 10 watts as being sufficient to ignite a mixture of town gas and air. Mixtures of methane and air are less sensitive than lighting gas and air.

### A METHOD OF DRYING AIR FOR BLAST FURNACES

THE efficiency of blast furnaces is greatly increased by the removal of moisture from the blast, and plant for effecting this is one of the recent departures in blast-furnace practice. The effect of moisture in the blast is to cool down the contents of the furnace at the point of admission of the air, since heat is required from the charge to raise the temperature of the moisture. The important reactions therefore take place higher up in the furnace, and the nett result is a reduction in its capacity. Moreover, in the presence of excess of moisture the chemical reactions are not of the desired nature. Many ways in which the moisture can be removed are in existence, the majority involving the use of some chemical substance, such as chloride of calcium, to absorb the moisture. These processes, however, leave much to be desired in the efficacy with which they remove the moisture, and a method is coming into use in which the



MOTOR-DRIVEN REFRIGERATING PLANT FOR SEPARATING  
MOISTURE FROM FURNACE BLAST AIR.

atmospheric moisture is converted into snow which can be readily removed.

A large plant, working on this principle, has recently been installed in the Midlands. It consists of six 400-h.p. continuous-current "Witton" motors, driving "Haslam" ammonia compressors; the accompanying illustration gives an excellent view of this plant. The motors have interpoles and cast-steel shells, and are controlled by switchgear standing by each set. The ammonia compressors form part of a refrigerating plant, producing cold brine which cools a series of pipes. The blast is passed through these pipes, which are in duplicate, and the snow is removed from the interior surface of one set at frequent intervals, the other set meanwhile being in commission for the refrigerating process. After the moisture has been removed, the blast passes on to the blowing engine. The electric motor equipment for this installation was supplied by the General Electric Co., Ltd., of Witton, Birmingham, and 67 Queen Victoria Street, London, E.C.

**Presentation.**—On May 9th, at the annual meeting of the South Wales Branch of the Association of Mining Electrical Engineers, Mr. Sydney F. Walker was presented with a gold watch by members of the branch as a token of esteem and respect in connection with his four years' presidency of the Branch. The presentation was made by Mr. G. Williams, of Aber Peryn, the present President.

**Hydro-electric Power in Indian Gold Mines.**—It is reported that owing to shortage of water in the Cauvery River, the supply of water-power to the Kolar gold mines has been reduced and their operations curtailed. Work is in hand for further water storage.

## LIFTING MAGNETS IN STEEL WORKS

ALTHOUGH many of the functions performed by lifting magnets in steel works involve the retention of the magnet in a fixed position, it is also often found that a considerable amount of work can be done by a magnet in different parts of the works, in each of which it would not pay to install a separate magnet. It is sometimes advantageous in such a case to provide a complete equipment, consisting of a steam-driven generator, in conjunction with a crane which can be moved about as required. A complete



WITTON-KRAMER SELF-CONTAINED CRANE  
AND MAGNET EQUIPMENT.

equipment, including a De Laval steam turbine and a 42-in. Witton-Kramer magnet, is shown in the accompanying illustration. At the moment of taking the photograph the magnet was engaged in the stacking of steel ingots, though at other times it is utilised for removing scrap and hot ingots. This complete equipment was supplied to a large Sheffield steel works by the Witton-Kramer Electric Tool & Hoist Co., Witton, for whom the General Electric Co., of 67 Queen Victoria Street, E.C., are the sole selling agents.

**Castleford Collieries.**—The Allerton-Bywater Collieries and the Ledston Luck Colliery, of Castleford, were visited a short time ago by a party composed of members of the Midland Institute of Mining, Civil, and Mechanical Engineers, and the Midland Counties Institution of Engineers. The Allerton plant was modernised five years ago, and includes a turbo-generator for supplying power for the workings. Arrangements have been made whereby the supply of the Yorkshire Electric Power Co. can be utilised during repairs to the plant or similar contingency. Large economies have been effected owing to the installation of the new plant. Formerly, when the output was between 9,000 and 10,000 tons a week, seventeen Lancashire boilers were in use; at present, with a weekly output of 17,000 tons, only five boilers are needed.

**International Congress of Mining, Metallurgy, and Engineering.**—The sixth International Congress of Mining, Metallurgy, Engineering and Economic Geology is to be held in London from July 12th to 17th, 1915, and an executive committee, of which Dr. Arthur Cooper is chairman, has already been formed. It will be remembered that the last Congress of this nature was at Düsseldorf in 1910. Electrical matters will be dealt with both in the metallurgical and engineering sections. Further information can be obtained from the Secretary to the Congress at 28 Victoria Street, S.W., from whom a copy of the bye-laws, on a form of application for membership, can be obtained.

**Verband Deutscher Elektrotechniker.**—At the 22nd annual meeting of the German Institutions of Electrical Engineers at Magdeburg on May 26th a monumental tablet to the memory of Werner von Siemens was unveiled, and lectures were given on recent progress in electrochemistry and electrometallurgy, electric steel refining, wireless telegraphy, and electricity on board ships. Prof. Dr. Klingenberg, of Berlin, was elected President of the Verband for the year 1914-15. Herr Dettmar announced that the specification of the Verband for lightning protection of buildings had been accepted as standard by a large number of municipalities and other governing bodies.

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## ELECTRICAL MINING AND METALLURGICAL PATENTS OF MAY

### Mining.

**D**URING the last month, the following specifications which deal with subjects of interest to mining electrical engineers have been published by the Patent Office:—No. 5,568 of 1913, G. J. Ralph, of Four Oaks, describes a combined portable electric lamp and fire-damp detector. The Wheatstone bridge principle is utilised. One arm of the bridge consists of a wire of platinum. Any inflammable gas coming in contact with the wire raises its temperature, and therefore its resistance, by catalytic action, and causes a galvanometer needle to deflect. A sliding contact is provided for bringing the needle to zero again. The percentage of fire damp present can be judged from the final position of this contact. An electrically operated rock drill, in which two solenoids are used to give a reciprocating motion to the drill, forms the subject of Specification No. 9,893 of 1913, by T. F. Wall (Birmingham). Siemens-Schuckertwerks Ges. of Berlin, in their Specification No. 11,313 of 1913, describe a method of control for A.C. commutating motors. Two levers only are used, one of which determines the position of the brushes and the other alters the stator connections for backward or forward running. Braking resistances are inserted in the circuit during lowering operations.

### Metallurgical.

Specification No. 6,911 of 1913, by O. Voigtländer (Essen, Germany), relates to the manufacture of tungsten. A mixture of tungsten trioxide and aluminium is burnt in a strongly heated furnace, in the presence of an inert gas. Pure homogeneous tungsten is said to result from this process. A method of copper refining by heating the metal in a furnace in the presence of the hot gases produced by the combustion of the fuel, is described by W. S. Rockey and H. Eldridge (New York) in Specification No. 7,409 of 1913. Oxidation of the fused metal is also prevented by pouring and ladling it in an atmosphere of these hot, reducing gases. An improved process of manufacturing aluminium nitride forms the subject of Specification No. 23,740 of 1913, by Soc. Gen. des Nitrures (Paris). A mixture of alumina and carbon is heated in an atmosphere containing nitrogen. The mixture is caused to pass along a tube which can be heated electrically to the required temperature. A further improvement in the above process whereby the furnace is divided into sections, with electrodes between every two sections so as to allow efficient heating of the interior, is described in Specification No. 24,347 of 1913, by the same patentees. Another invention also relating to electric furnaces is set forth in Specification No. 29,259 by J. I. Bronn and W. Schemmann (Rombach). It has been found that, in ordinary electric furnaces, the hot gases tend to escape through the furnace casing where the electrodes are led in, thus causing the latter to be gradually eaten away at this point. To prevent this, the electrodes are surrounded by a hollow cast-iron ring having perforations at the inside circumference, through which air, steam, or inert gas can be blown on to the electrode just above the point where it enters the aperture in the furnace, so as to drive back the hot gases and keep the electrode from being consumed. The Sodium Process Co. (U.S.A.), in a communication to G. B. Ellis, of London, describe an improved type of cathode for use in electrolytic furnaces. It is dealt with in Specification No. 29,418 of 1913, and consists of a large hollow tube of cast iron surrounding a smaller one, and electrically and mechanically connected to it at the top. The current thus has to flow in reverse directions through the cathode, so that the resulting magnetic effects neutralise each other.

**An Electrical Exhibition in Holland.**—In connection with a large electric power scheme in the province of Groningen, where a large power-house is being established, from which power will be distributed over a large area through about 50 sub-stations, an exhibition is being arranged at Helpman-Groningen in August and September next, where the applications of electricity to agriculture and small industries, as well as in the home, is to be demonstrated.

**Yorkshire Local Section of the Institution of Electrical Engineers.**—The result of the ballot for the election of members of the committee for next session has resulted in the election of Messrs. E. A. Barker, H. Bell, W. E. Burnand, and J. H. Schnauber. The committee will therefore be constituted as follows: Messrs. W. Emmott, Roslyn Holiday, Wilson Hartnoll, Thos. Roles, W. B. Woodhouse, H. E. Yerbury, W. M. Roger-son, W. Lang, H. A. Nevill, F. J. Lowe, E. A. Barker, H. Bell, W. E. Burnand, J. H. Schnauber.

## ELECTRIC TRACTION NOTES

The Italian Government has recently published details of the latest developments in the three-phase electrification of the State railways. The main lines near Genoa have been equipped for electric traction with overhead conductors. The locomotives have each a capacity of 2,000 h.p. and weigh 60 tons. The two motors are three-phase, 3,000-volt, 15-cycle machines, arranged to run in cascade and parallel, giving two synchronous speeds of 112½ and 225 r.p.m. They are mounted on a raised platform, and drive through crank pins and connecting rods. The starting resistances are of the water rheostat type, and the controllers are arranged to allow the locomotives to be run in multiple if required. The transmission is at 13,000 volts, transformation down to 3,000 volts being effected at four transformer stations, each of which is equipped with a three-phase transformer of the oil type, with a capacity of 3,600 k.v.a. These transformers are designed for 13,000 volts, but are adaptable to 22,000 volts by a change of connections. The power-house is situated at Chiapella, in Genoa, and contains two three-phase steam turbo-alternators, each giving 5,000 kw. at 13,000 volts and 15 periods.

The first of the new Westinghouse 8,000-kw. turbo-generators at the Greenwich Power Station of the London County Council Tramways was formally inaugurated last Thursday by Mr. G. H. Hume (Chairman of the Highways Committee).

The net profits from the Manchester Corporation Tramways last year amounted to £200,309, after meeting all capital charges. It is proposed to hand over £108,000 to relief of rates, and to carry the balance to reserve, renewals, and depreciation account.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Apropos of the recent statements in the Press regarding the installation of check call-meters at the subscriber's end of the telephones, we are informed that the scheme is as yet only in the experimental stage. Several different arrangements have been tried in the private exchange at the Post Office buildings, Roman Bath Street, E.C., with varying success, and we hope to be able to publish shortly some details of the one finally adopted. Some general details of the scheme are given in ELECTRICAL ENGINEERING, December 25th, 1913, page 729.

On Tuesday, May 26th, the new wireless stations for communication between Germany and America were tested for the first time under commercial conditions. The two stations (erected by the Hochfrequenz-Maschinen Akt.-Ges., the German company owning the Goldschmidt patents) are at Eilvese (Hanover) and Tuckerton respectively. According to the *Frankfurter Zeitung*, a dispatch of 3,000 words was sent from Tuckerton on Thursday and was received without any faults and without any repetition being necessary, in the course of a few hours. In January last, when only receiving apparatus was installed at Tuckerton, an official dispatch from the Kaiser to the President of the United States was successfully transmitted, but Thursday's message was the first under commercial conditions. The distance traversed is 4,000 miles. This Hochfrequenz system, it will be remembered, includes the Goldschmidt high-frequency generator.

The Merchant Shipping (Convention) Bill just introduced by the President of the Board of Trade makes certain amendments of the law relating to merchant shipping in order to give effect to the recommendations of the International Convention for the Safety of Life at Sea, signed in London in January this year. Part 3 relates to wireless telegraphy, under which it is provided that every ship registered in the United Kingdom carrying 50 or more persons shall be provided with a wireless installation, and also with certified operators and watchers. A new signal, called the safety signal, TTT, which is to be repeated at short intervals ten times at full power, is laid down for use by wireless stations which have to transmit to ships urgent information as to icebergs, derelicts, approaching storms, or other dangers. The master of every British ship is also compelled under penalty to report by wireless telegraphy or otherwise, as soon as possible, any dangerous ice, derelict, or other danger to navigation.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

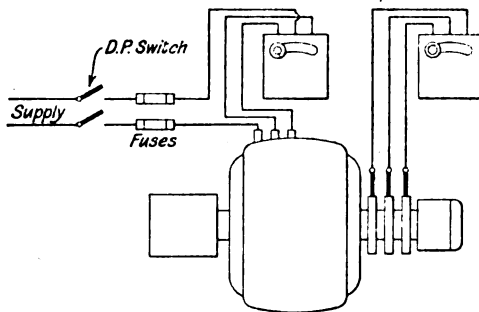
**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,394.

The diagram shows the connections of a single-phase induction motor which is used for driving some rubber-grinding machines. The main shafting is fitted with fast and loose pulleys, so that the motor can be started on no load. In spite



of this, the belt has to be pulled round before the motor will start. The supply is single-phase, 50 cycles, 220 volts, and the motor is rated at 5 h.p., 935 r.p.m. Is there any way of getting the motor to be self-starting?—"SIMPLEX."

(Replies must be received not later than first post, June 4th.)

### ANSWERS TO No. 1,392.

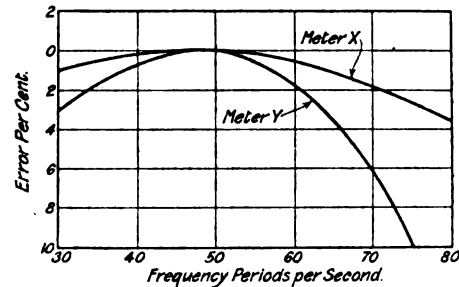
If there is a rise in frequency in a system owing to speeding up of the generator, the watt-hour meters are caused to run slow. What is the explanation of this, and what is the relation between the change of frequency and the slowing down of the meters?

The first award (10s.) is given to "J. E. R. R." for the following reply:—

Almost all meters register slow on a frequency higher than normal, but the errors are greater in some meters than others, and generally are greater in induction type meters than in the dynamometer type. For service work induction meters have placed the dynamometer type meters quite out of the field of alternating currents on account of the small size, cheapness, ease of adjustment, and calibration. With induction meters, the type most likely referred to, slow registration on increased frequency is due to a combination of alterations. In the first case the flux in both series and shunt magnets goes down as the frequency increases, as in any iron circuit magnetised by alternating current, and as the driving torque of the disc is approximately proportional to the product of these two fluxes the speed of the disc decreases as the square of the increase of frequency. The eddy currents in the disc which also help to create the driving torque will, however, increase with the increase of frequency, but owing to rotation the former action predominates, resulting in a decrease. Another result of increasing the frequency is an alteration in the phase angle between the driving fluxes, again tending to cause slow running. It also upsets all the adjusting devices for friction and quadrature.

The error differs greatly with different makes of instruments. On instruments of the high torque type, where a comparatively

large driving flux and strong brake magnets are used, the error in most cases is negligible, but in the case of the cheaper instruments, where the fluxes are light and the braking magnets weak, the error may become appreciable. An illustration is seen of this in the curves given below. Curve X is for



one of the former types, whilst curve Y is for a cheaper type. It will be seen how rapidly the error increases, directly the frequency gets above normal, in the cheap meter.

Some meters are added to inducing eddy currents in their cases, and in such instruments it is obvious that increasing the frequency will make them worse.

The second award (5s.) is made to "A. G. R.," who writes as follows:—

As we are dealing with an A.C. system, it is safe to assume that the watt-hour meters are of the induction type. The current through the pressure coil circuit of such a watt-hour meter is given by the equation—

$$I = \frac{E}{\sqrt{R^2 + X^2}}$$

where  $R$  = the resistance, and  $X$  = the reactance of this circuit. The variation in  $R$  will only be due to temperature changes, which need not be considered in this problem; but  $X$ , which is equal to  $2\pi\mu L$ , varies with the frequency.  $L$  = self-induction of the pressure coil circuit. Hence  $I$  will increase with decrease in the frequency, and vice versa. This change in current, due to variation in frequency, will cause a corresponding change in the voltage coil flux, and as the torque is proportional to the product of the maximum values of the voltage coil and current coil fluxes, it will vary also.

The expression for the torque may be written—

$$T = KF_v F_c \sin \theta$$

where  $F_v$  and  $F_c$  = maximum values of the voltage coil, and current coil fluxes respectively—

$\theta$  = the phase difference between them.

$K$  = a constant.

Again, owing to the inductance of the pressure coil, the angle of lag,  $\alpha$ , of the pressure coil current may be obtained from  $\tan \alpha = \frac{X}{R} = \frac{2\pi\mu L}{R}$  i.e., the tangent of this angle of lag

varies directly with the frequency. Also one may assume, without introducing any great error, that the voltage coil flux is in phase with the voltage coil current; so that it is evident that the angle  $\theta$  in the expression for torque is dependent on the frequency. Therefore a variation in frequency produces two effects: (1) increases or decreases the voltage coil flux, and (2) changes the phase relationship between the two operating fluxes. An increase in frequency will decrease the voltage coil current, but increase the phase difference. Now in the case under consideration the decrease in current will be greater than the increase in  $\sin \theta$ , and therefore the torque will decrease, and the meters will run slow.

The accompanying table shows the accuracy of a typical induction type watt-hour meter on different frequencies. The load and voltage were kept constant, and the meter was adjusted to be correct on 60 periods.

Frequency ..	40	50	60	70	80	90	100	110	120	130
Error % .....	-0.2	-0.1	—	-0.1	-0.3	-0.6	-1.0	-1.6	-2.5	-3.5

It will be seen that there is, in this case, a falling off in accuracy both with increasing and decreasing frequency. At small loads the error is generally increased, a 5 per cent. variation in frequency often causing a 1 per cent. to 2 per cent. error on half-load unless the instruments are carefully compensated. Electrodynamometer type watt-hour meters, when used on A.C. circuits, are not appreciably affected by changes in frequency unless the inductance of the coils is excessive; on the other hand, changes in power factor introduce considerable errors if the meter is not properly adjusted and elaborately compensated. The superiority of the induction over the dynamometer type on A.C. has practically confined the use of the latter to D.C. circuits.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published May 28th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

7,784/13. **Regulation of D.C. Generators.** A.E.G. In the ordinary shunt-wound machines, voltage regulation is only possible between narrow limits because of the instability of potential when the field is much below saturation. This invention avoids the above difficulty by eliminating one or more pairs of poles, when the voltage has to be reduced. The remaining poles still work at or near saturation, thus ensuring stability. The poles which are eliminated are first shunted by a resistance which is gradually cut out until the windings for these poles are short-circuited. This resistance can be afterwards used as an ordinary shunt regulator, in series with the remaining field windings. Five figures.

10,416/13. **Motor Control Panel.** A. H. RAILING and C. C. GARRARD. A fool-proof motor-starting device, in which the starting and shunt rheostats are operated by the same hand-wheel, which operates and is also electrically connected with, the circuit-breaker or switch. Thus the starting resistance cannot be cut out, until the switch has been closed. A similar arrangement may also be applied to A.C. motors. Two figures.

10,918/13. **Half-Watt Lamps.** B.T.H. Co. (*G.E. Co., U.S.A.*). The filament which is enclosed in a comparatively large spherical or pear-shaped bulb, consists of a squirted or drawn tungsten wire about 10 mils. diameter. It is supported on stout wires of wrought tungsten, sealed into the bulb. The inside of the bulb contains absolutely pure dry nitrogen at a pressure preferably equal to about atmospheric when the lamp is cold. Five figures.

29,418/13. **Electrolytic Furnace.** G. B. ELLIS (*Sodium Process Co.*). In the ordinary type of these furnaces, the cathode consists of a hollow tube of cast iron projecting up through the bottom of the furnace, and the deposited metal, such as sodium, being lighter than the electrolyte rises to the top of the furnace chamber, and forms a conducting layer which acts as an extension of the cathode. It has been found that when very heavy currents are used, objectionable magnetic reactions occur between the cast-iron cathode and the metallic layer. The above invention is intended to obviate this by surrounding the cathode by a hollow cast-iron cylinder of larger diameter, electrical connection between the two cylinders being made only at the top. The current thus has to flow through the cathode first in an upward direction through the outer cylinder, and then in a downward direction along the inner cylinder. Magnetic effects are thus avoided. Three figures.

11,106/13. **Wireless Signalling.** MARCONI WIRELESS TELEGRAPH Co. and C. P. RYAN. Signals are sent out at regular intervals, preferably by means of a pendulum. These signals are received in the ordinary way through a detector and relay, which causes an electromagnet to attract a pendulum or balance-wheel whose period of oscillation is equal to the interval between each signal. The amplitude of the swing of the pendulum is thus increased until the latter trips a contact, which gives the alarm. By allowing different intervals between the signals and having two or more contact trippers at the receiving station, different alarms can be given.

5,535/14. **Wireless Telegraphy.** G. LEIMBACH, Ph.D. The antennae are embedded in the earth, and consist of freezing tubes similar to those used in shaft sinking. By this means insulation from underground water is obtained. The effective length of the antennae is the amount which extends below the lower level of the underground water. By increasing this length, the range of communication can be extended if desired.

## Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** RAILING and ANGOLD [Arc lamp] 12,919/13; GEB. SIEMENS & Co. [Searchlight electrodes] 28,286/13; HUGHES [Arc lamps] 2,737/14.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** GRAHAM and RICKETS [Low-pressure distribution from high-pressure mains] 10,920/13; LEITNER [Circuit control] 11,115/13; RESISTO-ELECTRICAL MFG. Co. and RUZICKA [Insulating material] 11,975/13; GIRARDELLI [Control system for motors] 1,265/14.

**Dynamos, Motors, and Transformers:** ROSENBERG [Synchronous motors] 11,506/13; KLINKENBERG [Motor-braking devices] 13,135/13; HEINZ [Converter] 28,630/13; KEMP & LAURITZER [Transformation of A.C. currents] 8,021/14.

**Electrometallurgy and Electrochemistry:** HUNT and GIDDEN [Electrolytic sulphate process] 11,634/13; SOC. ANON. "LE FER" [Electrolytic iron] 16,565/13.

**Heating and Cooking:** VENNER [Heating elements] 13,988/13; BENSON & Co. and SIMS [Heating appliances] 26,462/13.

**Ignition:** ELECTRIC IGNITION Co. and COX [Spark plug] 15,974/13; SCHRÖTER & KÜSTER [Contact breakers] 28,535/13.

**Incandescent Lamps:** LAX [Pocket lamps] 18,733/13; BENJAMIN [Pavement lights] 23,770/13.

**Instruments and Meters:** KELVIN & JAMES WHITE, LTD., and FIELD [Mariners' compass] 11,561/13; EDELMANN [Alarm thermometers] 9,570/14.

**Telephony and Telegraphy:** SOLDATENCOW [Printing telegraph] 3,326/13; CORWIN [Telephone exchange system] 11,177/13; MARCONI [Wireless telegraph transmitters] 11,371/13; MARCONI'S WIRELESS TELEGRAPH Co. and FRANKLIN [Wireless receivers] 11,453/13; WANIBUCHI [Localising electromagnetic waves] 17,164/13; GRAHAM [Telephone receiver] 26,288/13; STEIDLE [Automatic telephony] 26,602/13; GRAHAM [Watertight telephone] 26,708/13; CHAUDET [Crystal detectors] 2,935/14.

**Traction:** MUNRO and R. E. T. CONSTRUCTION Co. [Trolleys for vehicles] 3,857/13, 11,629/13.

**Miscellaneous:** MYLO [Annunciator for bells] 11,191/13; GREVILLE [Medical appliance] 11,274/13; SMITH and TURNER [Exercising apparatus] 4,321/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, and Transformers:** GASNIER [Machines for use on motor-cars] 11,244/14.

**Electrometallurgy and Chemistry:** LEVIN [Electrolytic apparatus] 3,654/14.

**Instruments and Meters:** VERTRIEBS GES. MAGNET ELEKTRISCHER APPARATE [Water-level indicator] 7,462/14; CHAPMAN [Electrically-heated instruments] 8,814/14.

**Storage Batteries:** BEAUPEL [Accumulators] 11,325/14.

**Telegraphy and Telephony:** DE LANGE [Thermo telephones] 4,184/14; PLEJEL [Loading coils] 8,185/14; SIEMENS & HALSKE AKT.-GES. [Telephone systems] 11,211/14.

**Switchgear, Fuses, and Fittings:** SIEMENS SCHUCKERTWERKE GES. [Circuit breakers] 10,082/14.

## Opposition to Grant of Patents

6,369/13. **Telephone Exchange System.** D. H. KENNEDY and J. W. TURNER. Opposition has been entered to the grant of this patent.

1,862/13. **Earthing Clip.** F. TOWNSON. An appeal has been lodged from the Comptroller's decision to allow the grant of this patent.

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

10,580/00. **Electric Furnaces.** O. IMRAY (*F. Morani*). This invention relates to the construction of high-power furnaces. The connections between the electrodes of the furnace and the supply mains are in the form of metallic plates, which are water jacketed where the heating effect is greatest, and are clamped securely in position. The molten metal is drawn off from the furnace through longitudinal slits, which are water jacketed all round their edges, and are situated at the desired height in the furnace casing. In the case of alternating current furnaces, where more than two electrodes are employed, the latter must be arranged so that induction effects are minimised. Twenty figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, &c.:** M. BOUCHET [Wire coupling] 16,581/04.

**Dynamos, Motors, and Transformers:** B. T.-H. Co. (*G. E. Co., U.S.A.*) [Dynamo windings for three-wire systems] 3,189/05.

**Storage Batteries:** ACCUMULATOREN FABRIK AKT.-GES [Accumulator plates] 27,221/09.

**Switchgear, Fuses, and Fittings:** J. H. TUCKER [Tumbler switch] 3,492/04.

**Telephony and Telegraphy:** C. ADAMS-RANDALL [Microphones] 3,717/09.

**Miscellaneous:** J. W. BROWN [Electro hydraulic lifts] 3,477/03; H. A. CAMPICHE [Electric clocks] 3,449/04; L. J. BLAKE [Submarine signalling] 3,360/07; I. J. OWEN [Advertising device] 3,175/09.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 313. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**FANS.**—An artistic leaflet received from The Edison & Swan United Electric Light Co. (Ponders End, Middlesex) deals with the "Ediswan" electric fans. A great variety of sizes and types are illustrated, including their convertible type, which can be used either as a wall or table fan, the larger ceiling fan, which is suitable for the ventilation of large rooms or halls, and the porthole fan, which is adapted for drawing air into a room through a suitable aperture in the wall or ceiling. The fans are made to work with either direct or alternating current, and several types are provided with means for regulating the speed to obtain the degree of coolness desired.

**MOTOR AND GENERATOR PULLEYS.**—The latest pamphlet to hand from the British Thomson-Houston Co. (83 Cannon Street, E.C.) illustrates two types of pulley, which they are manufacturing for use on motors and generators. For the smaller sizes, up to 9-in. diameter, solid cast-iron pulleys are recommended; beyond this size it is thought advisable to make the pulleys with cast-iron arms and boss, and mild steel rim.

**BALING PRESSES.**—We have received from David A. Bridge & Co. (Castleton, Manchester) a new catalogue dealing with Cummin's patent hydraulic baling presses.

**MINING PLANT.**—A booklet from J. H. Holmes & Co. (Portland Road, Newcastle-on-Tyne) contains some very fine illustrations of some of their manufactures which are of special interest to mining engineers. They include D.C. generators, alternators, pumping sets, both centrifugal and reciprocating, and various types of haulage gear. In the larger sizes of the latter, double helical gearing is employed in obtaining the power from the motor shaft. A coal cutter and a motor-driven air-compressor is also illustrated. A large variety of switches, switch pillars, and controllers are included.

**CORRESPONDENCE INSTRUCTION.**—We have received from the Cambrian Correspondence Mining and Engineering School (Cemetery Road, Porth, Glamorganshire) a copy of their handbook giving a few particulars of the methods employed and sample papers set at the examinations for which their students are trained.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ELECTRICAL PLANT.**—A comprehensive catalogue issued by the A.E.G. Electric Co., Ltd., should be of interest to everyone who is in any way connected with the consumption of electricity. It is divided into ten sections, and deals with almost every type of plant, apparatus, or fittings which are likely to be used in either household or workshop. The fact that lighting, heating, and cooking apparatus, fans, air compressors, and clocks all find a place in this booklet, may give some idea of its range.

**CELL TESTING VOLTMETER.**—A leaflet just issued by Crompton & Co., Ltd. (Chelmsford), describes a dead-beat voltmeter specially adapted for cell testing. A special feature of this instrument is the ease with which it can be manipulated.

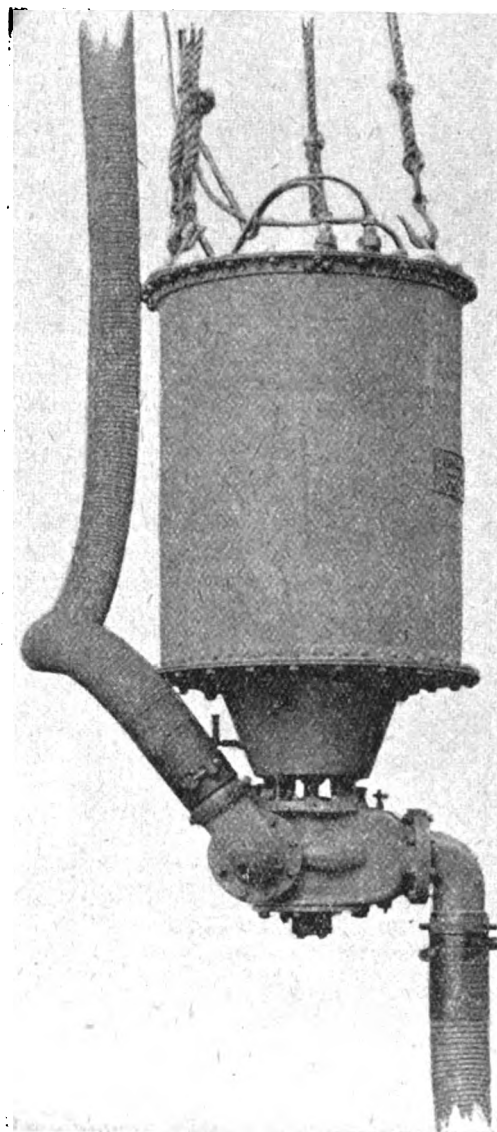
**D.C. MACHINERY.**—A new 28-page catalogue published by the Adnil Electric Co., Ltd. (Adnil Building, Artillery Lane, E.C.), is devoted to their G.F. type D.C. dynamos and motors. The standard machines are shunt wound, with interpoles, but the windings can be made either series or compound at a slightly increased cost. The outputs of the motors range from 4 to 125 h.p., whilst the dynamo outputs vary from 3.5 to 90 kw. Although these machines are open type, a fan is employed to assist the ventilation, so that the outputs are exceptionally high. A list of D.C. motor-starters is also included. The tables showing the gross and net weights of the various sizes of machines and accessories will probably be of assistance to a large number of purchasers.

**ELECTRIC WINCHES.**—A considerable variety of designs of electrically-driven winches, both for shipboard use and for file driving, shipyard and dry-dock purposes, are described in an illustrated catalogue from the Sunderland Forge & Engineering Co., Ltd., 31 Budge Row, Cannon Street, E.C.

**TECHNICAL ADVERTISING.**—A little pamphlet entitled "Out of the Rut," calling attention to examples of attractive methods of advertising, is to hand from Ernest Ingram Hill (26 Stanton Road, Wimbledon, S.W.).

### ELECTRIC SALVAGE PUMP

IN marine salvage operations electrically-driven pumps of a size and type that will enable them to be lowered into flooded compartments through small hatchways, and to work entirely submerged, are often required. Modern vessels are of so great a depth that it is frequently impossible to pump out a flooded compartment by apparatus on deck, or through piping taken from pumps of a salvage craft alongside. The apparatus illustrated shows a submersible electric pump introduced by Messrs. Merryweather & Sons (Greenwich). The motor is of a standard type that can be run from current supplied by an ordinary ship-lighting equipment, and is



ELECTRICALLY-DRIVEN SALVAGE PUMP.

enclosed in a light galvanised steel watertight casing, with large doors at the end that can be readily opened when desired. The motor is connected direct to the spindle of a centrifugal pump fixed to the lower end of the motor-casing through a watertight stuffing box. Merryweather's special design of watertight terminals are fitted to the motor for the connection of the flexible cable. The complete apparatus can be slung from a tackle, and will work perfectly in such a position, or can be operated just as well when lying in a horizontal position. It can be lowered directly into the water, if facility of access permits, or to within a distance allowable for a length of flexible suction pipe to be got into

## DIE CASTINGS

must not only "look" all right: they must BE all right: they must leave nothing to chance: there must be nothing experimental about their adoption.

### "PRANA" DIE CASTINGS

(manufactured by the Firm who use them in their own business) are guaranteed to fulfil all these conditions.

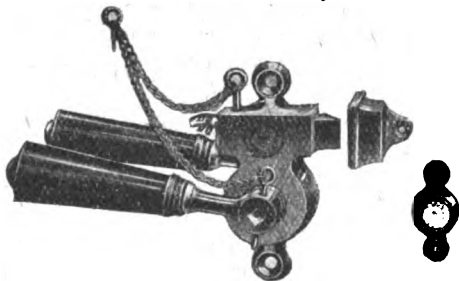
*Accurate and Interchangeable.  
British-made—"Tough & True."*

**AERATORS, Ltd.** (Dept. EES) Upper Edmonton, London, N.

position. Owing to the general method of construction, the whole apparatus will safely withstand any amount of rough usage, such as it may get in a sea-way. It can also be rolled along a deck on its end flanges quite conveniently. These pumps are made in two standard sizes, with either one or two suction and delivery branches, each 6 in. diam., and capable of delivering 214 tons and 295 tons per hour respectively. Merryweathers particularly recommend this type of pumping apparatus to salvage masters, on account of the way in which power can be supplied from one vessel to another in a heavy sea way. For instance, a vessel can be taken in tow and the electric power cable laid along the towing hawser, thus allowing pumping operations to be kept up while making port.

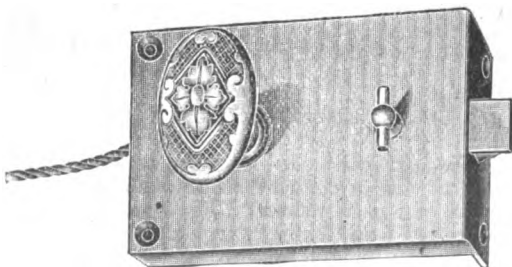
### LAVIGNE ELECTRIC LOCKS

A SERIES of locks are now being manufactured by the Sun Electrical Co. (118-120 Charing Cross Rd., W.C.), which are fitted with an electric alarm device, for ringing a bell as soon as a key is inserted into the lock. The electrical construction, which is entirely enclosed in the lock



SHOP-DOOR HANDLE.

case, consists essentially of a contact piece held in position by light springs. When a key or similar article enters the lock, the circuit is completed, and the alarm comes into operation. The two connecting wires from the lock are intended to be concealed in the mouldings of the door and connected to the hinges, thus making it impossible for a



NIGHT LATCH.

would-be burglar to tamper with them. The same invention has also been applied to the ringing of shop-door bells, so that when the handle is turned to open the door, the bell circuit is completed. The illustrations show two typical applications of this device. The appearance of these locks

combines neatness with great mechanical strength. Although the standard type of lock is intended to be connected directly in the bell circuit, there is nothing to prevent the use of a relay, so that once the alarm bell had been started, it would continue to ring even after the key had been withdrawn from the lock.

### ELECTRIC TOLLING BELL

AN entirely novel construction has been adopted for the "Kingsway" Electric Tolling Bell, which has been put on the market by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.).

The bells are intended for any purpose for which a loud-sounding alarm is required.

The construction of the "Kingsway" Electric Tolling Bell is as follows:—The striking hammer is connected to a rod which is screwed into an armature, whose movements are controlled by a powerful electro-magnet through a peculiar form of contact. The electro-magnetic mechanism is con-

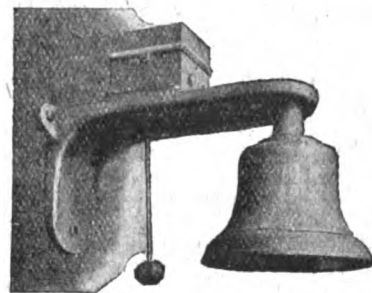


FIG. 1.

tained in the massive cast-iron box, and the moment current is switched on, the electro-magnets are energised, and attract the armature. This action causes the hammer to strike the gong, and at the same time the electric circuit is opened by the contact-breaker, and the hammer swings back to an equal amplitude the other side of the neutral position. When the hammer has commenced its return swing the electric circuit is completed, and the armature therefore again attracted, with the result that an extremely powerful blow is imparted to the gong. This cycle of operations is continued so long as the circuit is closed.

The vital part of the apparatus is the contact, and this is unique in its action and is self-cleaning, so that there is no likelihood of trouble arising from faulty contacts, and all sparking trouble is eliminated by the use of a non-inductive resistance connected directly across the contacts. By refer-

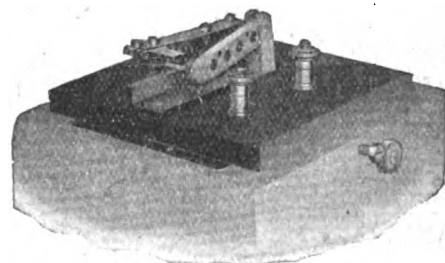


FIG. 2.

ence to Fig. 2, the construction of the contact-maker can be seen. The gongs are of best bell metal, and this, together with the slow-striking action of the movement (twice per second or less if the hammer rod is lengthened), allows of the full tone of the gong being obtained. The "Kingsway" Electric Tolling Bell is made in two sizes. In the first, the gong is approximately 12 in. in diameter, and averages 42 lb. in weight. The energy required is one ampere at 15 volts. In the second, which is for use where the sound is to be carried a very long way, the gong averages 182 lb. in weight, and is approximately 17 in. in diameter. The energy required is one ampere at 25 volts. In both cases, the mechanism is absolutely waterproof, and it can be fitted to existing hand-pulled bells. One remarkable point is the very low energy consumption whereby ordinary battery power is all that is required.

The makers will be pleased to send full particulars to those interested.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Atherton.**—Sanction is to be sought for loans of £850 for mains, £900 for transformers, and £250 for switchgear.

**Australia.**—A booster set for charging a battery of 288 cells is required by the N.S.W. Government Railways & Tramways Department. Copies of the specification may be seen at 73 Basinghall Street, E.C.

**Bicester.**—A proposal for the formation of an electric lighting company for this district is under consideration.

**Colne.**—Mr. S. J. Watson, Borough Electrical Engineer at Bury, has been asked to report with regard to new generating plant.

**Eastbourne.**—The Borough Electrical Engineer recommends the replacement of the existing switchboard with a more up-to-date pattern at an estimated cost of about £1,400.

**Harrogate.**—One 288 pipe economiser in three banks. June 22nd. (See advertisement on another page.)

**Plymouth.**—Mains extensions at an estimated cost of £260 are to be carried out.

**Russia.**—A loan of £124,000 is to be raised by the Nijni-Novgorod Municipal Authority for electric lighting.

**South Africa.**—The Worcester (Cape Province) Municipality invites tenders for a complete generating station; also transmission lines, street lighting, meters, and house wiring. Particulars from Professor Bohle, 25 Rosemead Avenue, Cape Town.

The Robertson Municipality is proposing to raise a loan of £10,000 for an electric lighting scheme.

**Stalybridge.**—The Joint Board proposes to erect a new power station.

**Stockton-on-Tees.**—A supply of three-core cable is required. Borough Electrical Engineer, June 12th. (See advertisement on another page.)

**Sunderland.**—A 1,200-kw. sub-station is to be erected by the Corporation Electricity Department for the River Wear Commissioners.

**Wrexham.**—A 300-kw. generating set with condenser is to be installed.

### Wiring

**Aberdeen.**—Electric lighting at police offices. City Architect, June 10th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barrow-in-Furness.**—Three new schools.

**Bolton.**—Extensions at Messrs. Crosses & Winkworth's mill, Grant Street; also at Swan Lane Spinning Mill.

**Bristol.**—Extension of Art Gallery.

**Croydon.**—Fifty-four houses in Norbury Court Road. C. G. Allen, Norbury.—Six houses in Buller Road. Scratchley Bros., 111 High Street, Thornton Heath.

**Maidstone.**—New county police barracks (£80,000).

**Shipley.**—New spinning mill. Architects, Moore & Crabtree, 4 Exchange Buildings, Bradford.

### Miscellaneous

**Australia.**—Ninety-five common battery telephone switchboards are required by the Deputy Postmaster-General, Melbourne. Copies of the specification may be seen at 73 Basinghall Street, E.C.

**Colchester.**—Twelve months' supply of electrical sundries for Severalls Asylum, Colchester. Clerk, Severalls, Colchester.

**Darwen.**—Two double-deck tramcars are required. Tramways Manager, June 15th.

**London: L.C.C.**—Tenders are invited for, alternatively, 50, 100, or 150 complete trailer cars, and the equipment of 200 existing electric tramcars with couplers and traction gear for drawing trailers. (See advertisement on another page.)

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Falkirk.**—The contract for a twelve months' supply of meters has been placed with Messrs. Chamberlain & Hookham.

**L. & N.W. Railway.**—An order has been placed with the British Westinghouse Co. for high and low tension switchgear to the value of between £50,000 and £60,000 for the eleven sub-stations of the London & North-Western Railway. (See article on page 303.)

**Malvern.**—A contract for a 150-kw. generating set has been placed with Messrs. Bellis & Morcom and the British Westinghouse Co.

The tender of the General Electric Co., Ltd., for the supply of all types of Osram lamps has been accepted by the Comptroller of Stores, G.P.O., Bedford Street, London, W.C.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. George Smith & Son, of 5, Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night was £65 to £65 10s. (last week, £65 5s. to £65 15s.).

**Liquidations.**—A meeting of the De Forest Wireless Telegraph Syndicate will be held at the offices of Messrs. Allen, Attfield & Co., 147 Leadenhall Street, E.C., on June 29th, at 12.30 p.m., to hear the liquidator's account of the winding-up.

**Bankruptcies.**—The last day for receiving proofs in the bankruptcy of J. Swainson, Electrical Engineer, 22 Bootle Street, Manchester, is June 16th. The trustee is A. Yearsley, 27 Brazennose Street, Manchester.

A first and final dividend of 8s. 3d. in the £ is payable in the bankruptcy of Charles Blake, trading as the Bilston Electrical Co., 4 Church Street, Bilston. The dividend is payable at the Official Receiver's Office, 30 Lichfield Street, Wolverhampton.

## APPOINTMENTS AND PERSONAL NOTES

Mr. E. G. Mawbey, Borough Surveyor at Leicester, has been awarded an honorarium of £500 in consideration of his having acted as electrical and civil consulting engineer to the Corporation tramways system since its inception.

Mr. C. Bottomley Smith, Chief Engineer to the old Hove Electric Lighting Co., and who, as we announced last week, has been transferred to a similar position under the Corporation, has been presented with a gold chronograph and sovereign-case, subscribed for by the staff.

A technical assistant and testing engineer is required in the Stoke-on-Trent Electricity Department. Salary, £140 per annum. (See advertisement on another page.)

An assistant lecturer is required in the Engineering Department of the Workington Technical School. Salary £120 per annum, with £10 increments. (See advertisement on another page.)

A traffic superintendent is required by an important telephone company abroad. (See advertisement on another page.)

**Electric Clocks.**—Three years ago, when Vickers, Sons & Maxim, Ltd., built their new offices, "Vickers House," Broadway, Westminster, various systems of electric clocks were brought to their notice, and they selected three for trial, allocating two floors to each. The Synchronome Co., Ltd. (32 and 34 Clerkenwell Road, E.C.), inform us that the test has now ended in favour of the Synchronome system, which is also installed at Messrs. Vickers' Sheffield, Barrow, and Montreal works. At a week's notice the Synchronome Co., Ltd., were required to add 52 clocks of a special type to the 73 Synchronome dials already installed. This was successfully achieved during the Whitsuntide holidays, and all was in order for the return of the staff on Tuesday morning. An electric time circuit of 125 dials in the administrative offices of a single firm probably constitutes a record.

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.



## LOCAL NOTES

**Belfast:** *Position of Electrical Undertaking.*—The Tramways and Electricity Committee has decided to call in Mr. J. F. C. Snell to advise as to the present condition of the generating plant and with regard to further developments of the electricity undertaking.

**Bexhill:** *Officials as Consulting Engineers.*—A recommendation by the Electricity Committee that Mr. A. C. Ticehurst, the Assistant Electrical Engineer, should be allowed to advise the Battle Board of Guardians as consulting engineer has been rejected by the Council.

**Blackburn:** *Continued Progress of Electricity Undertaking.*—The accounts for the past year show that the undertaking has fully maintained the considerable progress shown during recent years. The installation of the new system of street lighting in the centre part of the town has been completed, and a noticeable feature of the applications for supply has been the large number received for the lighting of small residential property and shops in districts where mains are already laid, thus involving only a very small capital expenditure. A number of applications for supply by neighbouring local authorities are under consideration. The net profit for the year was £4,687, compared with £3,521 in 1912-18, after setting aside £350 for depreciation and, of course, meeting capital charges.

**Blackpool:** *Electric Cooking.*—A complete electric cooking equipment has been placed in the new Tower dining-room, which was opened on Saturday.

**Cleethorpes:** *Heating and Cooking.*—In consequence of the great demand for power for heating and cooking, the Electricity Committee is endeavouring to obtain a reduction in the price of current purchased from the Tramways Co. and used for this purpose.

**Grimsby:** *Large Electricity Profits.*—The net profit of £4,061 on the electricity undertaking for last year was much larger than had been anticipated in view of the high price of coal and large payments out of revenue for mains and meters. It has been decided to transfer £500 to relief of rates.

**Hightown:** *An Electricity and Gas Scheme.*—The only means of a public supply of lighting in this small town, which adjoins Liverpool, is petrol-air gas, but the Company supplying it is in liquidation, and has been purchased by a new company known as the Hightown Gas & Electricity Co. This latter was before Parliament last week asking for statutory powers in the district, and there was no opposition from the local council. There is, however, in the district a small generating plant owned by a lady, which supplies a few houses, and an overhead cable is carried across one of the roads with the permission of the Council. The owner of this generating plant petitioned against the bill, and urged that her undertaking should be purchased by the new company. A Committee of the House of Lords, however, decided that she had no *locus standi*, and the bill was sent forward for third reading.

**London:** *Islington: Guardians and Electric Lighting.*—With reference to the note on this subject on page 300 of our last issue, our attention is called to the fact that it would appear from this that Messrs. Hancock & Dykes are the consulting engineers to the Guardians for the proposed electrical scheme. This, however, is not the case. Mr. A. H. Dykes was merely retained just before the inquiry to give expert evidence in support of the application. The engineer to the scheme is Mr. J. S. Enright.

**Stepney:** *Electricity Accounts.*—The accounts of the Electricity Department for the year to March 31st show a net profit of £14,177, to which is added £1,481, brought forward from the previous year. The sum of £5,000 is carried to reserve, £4,182 for replacement of plant, &c., £2,723 is written off capital account in respect of assets now non-existent, and £2,305 towards expenditure in the nature of capital. The balance is carried forward.

**Manchester:** *Large Electricity Profits.*—The electricity undertaking last year showed a net profit of £36,000, of which £28,700 has been devoted to relief of rates. Of the balance £779 has been carried to general reserve, and the remainder is to be used for capital purposes. The number of units sold were 118,000,000.

**Nottingham:** *Large Electricity Profits.*—The net profit from the electricity undertaking for 1913-14 allows of the sum of £8,000 being transferred to relief of rates. In addition, £4,471 is carried forward.

**Nuneaton:** *Bonus to Electrical Workmen.*—As an appreciation of the good work carried out by the electricity staff last year, as a result of which a large profit was made and £500 transferred to the relief of rates, the Council has decided to present each workman with a bonus of one week's wages.

**Portsmouth:** *Electricity Profits for Relief of Rates.*—The Electricity Committee recommends the allocation of £3,000 from the profits of the electricity undertaking last year to relief of rates. In addition, the sum of £1,000 is to be placed to reserve and £364 to the fire insurance fund.

**Richmond:** *Street Lighting.*—The Richmond (Surrey) Electric Light & Power Co. is to give a demonstration in street electric lighting. At present the streets are lighted by the Brentford & Richmond Gas Cos.

**Sunderland:** *Another Record Year.*—The Electricity Department improved last year upon its record year of 1912-13, the output being 1½ million units more. The works costs are now down to 0·97d. per unit, which is again a record for the department. Mr. A. S. Blackman, General Manager of the Department, in his report, states that up to the present the cooking load has been deliberately held back on account of the difficulty of obtaining suitable apparatus, but trustworthy cookers are now available, and will, he anticipates, come largely into use in the near future. The net profit on the department last year was £10,087, of which £9,000 was carried to depreciation and renewal fund.

**Torpoint:** *Electric Lighting Abandoned.*—After considerable argument and discussion, the Council has decided not to go forward with the proposed electric lighting scheme.

**Walsall:** *Profits on Electricity Undertaking.*—The accounts of the electricity undertaking for the fifteen months to March 31st show a net profit of £925. The scheme for the erection of a new power station at an estimated cost of £74,850, referred to on page 275 of our last issue, has been sanctioned by the Council. The Committee pointed out, however, that had the contributions been payable quarterly, instead of yearly, there would have been a loss of £472.

**Wellington (Salop):** *Sale of Lighting Order.*—The Council has received an offer for the purchase of its Electric Lighting Order for a sum of £200. The Electric Lighting Committee recommends its acceptance.

**West Hartlepool:** *Waste Gas Scheme.*—There is a deficiency of £1,878 upon the working of the electricity undertaking last year, owing to the expenditure upon the new waste gas plant at the Seaton Carew Ironworks. The full benefits from this scheme will now begin to make themselves felt.

**Worcester:** *Capital Payments from Revenue.*—The accounts of the electricity undertaking for the past year, which show a deficiency of £505, do not really indicate the true strength of the position of the undertaking. For many years the Committee has carried out the policy of meeting many payments of a capital nature from revenue, which has made it impossible to show net profits. More satisfactory results are now looked for in the future, and the deficiency above mentioned is to be carried forward, as it is anticipated that the profits for the current year will more than cancel that amount.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Electric Construction Co.**—Considerable satisfaction was expressed with the results of the past year's working (ELECTRICAL ENGINEERING, May 14th, p. 276) at the annual meeting last week. Important extensions are being carried out to the works to enable the company to cope with its increasing trade.

**Madras Electric Supply Corporation.**—There was a loss of £10,525 for 1913, but this was not altogether unforeseen, as in their report for 1912 the directors warned the shareholders that the working for 1913 could not be otherwise than unsatisfactory consequent upon having to rely on the old plant to meet increasing load. Unfortunately, the position was aggravated by a breakdown of the boiler plant in the early part of the year. The scheme for the consolidation of the Supply Company and the Tramway Company has been brought into operation, and better results are looked for when the new generating plant is installed.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 389 [VOL. X., No. 24]  
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THURSDAY, JUNE 11, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLE FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word minimum One Shilling, three insertions for the price of two.

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### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn.  
Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

A 15,000 kw. turbo-alternator, running at 1000 r.p.m., has recently been put to work in the Manchester Electricity Works. (Page 316.)

THE Institution of Electrical Engineers are landlords of offices of the Women's Social and Political Union which were raided by the police on Tuesday. (Page 317.)

A LIST of members and others who have signified their intention of attending the Convention of the Incorporated Municipal Electrical Association at Birmingham is given. (Page 317.)

WE also publish portraits of the President of the Association and the readers of papers, together with descriptive notes on the works to be visited during the Convention. (Page 319.)

THE Summer Lane station of the Birmingham Corporation will be one of the principal visits, and the latest turbo-generators at this large works will be compared with the older reciprocating plant. (Page 320.)

TURBO-GENERATORS which have superseded reciprocating plant will also be seen at the Coventry Electricity Works. (Page 322.)

OF the manufacturing works visited, one of the most interesting from the electrical point of view will be the huge establishment of the General Electric Co. at Witton, where the engineering works, the fan and small motor works, the switchgear and arc lamp departments, the central stores, and the conduit works, will be inspected. (Page 322.)

AMONG other works to be visited which we describe are those of Belliss and Morecom, Birmingham,

Willans and Robinson, Rugby; The Daimler Motor Co., Coventry; and J. H. Tucker and Co., Birmingham; and the waterpower generating station at Worcester. (Pages 324 to 327.)

DURING the Convention, a demonstration of electric vehicles will be held. Illustrated descriptive notes are given of the vehicles which will probably be present. (Page 327.)

AN apparatus for the electrical transmission of images of moving objects is described. (Page 328.)

A PROCESS for bleaching wax by electrically produced ozone has recently been introduced. (Page 328.)

THE relative merits of different methods of wiring ceiling roses are discussed in our Questions and Answers columns. (Page 329.)

THE Committee of Engineers of the London electric supply co.'s are getting out a joint scheme for the re-organisation of electricity supply in London. (Page 329.)

A PATENT by the B. T.-H. Co. for the manufacture of low hysteresis steel, and one by G. Marconi relating to wireless transmission, were amongst the specifications published last week.—A Patent for an adjustable resistance box expires this week after a life of fourteen years, and four Patents relating to metallic filament lamps have been allowed to become void. (Page 330.)

THE working expenses of the Dolter surface-contact system at Lincoln is 5·91d., against 6·651d. for the Lorain system at Wolverhampton.—Mr. J. McElroy, General Manager of the Manchester Corporation Tramways, is convinced that the time is far distant when motor-omnibuses will supplant tramways.—The York Tramway Manager has reported against the "pay-as-you-enter" system. (Page 331.)

THE Committee on Wireless Telegraphy Research recommends the establishment of a permanent National Telegraphic Research Committee, with a special experimental equipment at the National Physical Laboratory. (Page 331.)

OUR Trade Section contains illustrated notes on a new watertight pull switch, on indirect lighting, and on decorative illuminations. (Page 332.)

LARGE expenditures upon new plant are contemplated at Sunderland, West Ham, Worcester, and Bexley; a lighting battery, booster, and switchboard are required at Stretford; transformers, motors, meters, and starting switches at Manchester; converting plant and switchgear at Bolton; cable at Antwerp; high-tension insulators at Sydney; rotary converters and frequency changers for the Melbourne suburban railways. (Page 333.)

THE Dundee electricity undertaking pays £6,500 in rates on an annual income of £61,000, against £5,800 by the Gas Department on an annual income of £158,000.—The charge for public arc lighting in Edinburgh is to be reduced by 30s. per lamp per annum.—A deputation from the Manchester Electricity Depart-

ment is to visit a number of large power schemes abroad.—In spite of losses, the Cleckheaton Council has refused to dispose of its electrical undertaking. (Page 334.)

THE whole of the lighting business of the Birmingham District Power and Traction Co. is now being transferred to the Shropshire, Worcestershire, and Staffordshire Electric Power Co. (Page 334.)

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JUNE 11TH.

*Royal Institution.*

3 p.m. Afternoon Lecture II. "Faraday and the Foundations of Electrical Engineering," by Prof. S. P. Thompson, F.R.S.

*Faraday Society.*

8 p.m. At Institution of Electrical Engineers. Presidential address on "Advances in the Metallurgy of Iron and Steel," by Sir Robert Hadfield, F.R.S.

FRIDAY, JUNE 12TH.

*Physical Society.*

8 p.m. At Imperial College of Science, South Kensington, S.W. (1) "A Magnetograph for Measuring Variations in the Horizontal Intensity of the Earth's Magnetic Field," by F. E. Smith. (2) "The Atomic Weight of Copper by Electrolysis," by A. G. Shrimpton. (3) "Note on an Improvement in the Einthoven String Galvanometer," by W. H. Apthorpe.

MONDAY, JUNE 15TH

*Incorporated Municipal Electrical Association.*

8 p.m. Birmingham Convention. Reception and Smoking Concert at Grand Hotel.

TUESDAY, JUNE 16TH.

*Incorporated Municipal Electrical Association.*

10 a.m. Birmingham Convention. Meeting at Midland Institute. (1) Presidential Address by R. A. Chattock. (2) "Commercial Development of Electrical Supply in Towns of Moderate Size," by W. A. Vignoles.

2.30 p.m. Demonstration of Electric Vehicles and Visits to Works of General Electric Co. and Belliss & Morcom.

7 p.m. Annual dinner at Grand Hotel.

WEDNESDAY, JUNE 17TH.

*Incorporated Municipal Electrical Association.*

10 a.m. Birmingham Convention. Meeting at St. Mary's Hall, Coventry. "The Design and Operation of Modern Boiler-House Plant," by S. E. Fedden.

2.30 p.m. Visits to Coventry Electricity Works and Daimler Co.'s Works.

8.30 p.m. Reception and Dance at Council House, Birmingham.

THURSDAY, JUNE 18TH.

*Incorporated Municipal Electrical Association.*

10.30 a.m. Birmingham Convention. Meeting at Memorial Lecture Room. "The Standardisation of Tariffs," by J. H. Bowden.

2.30 p.m. Trip to Warwick Castle.

8.30 p.m. Fête and Concert at Botanical Gardens.

"Point Fives."

10 p.m. Meeting and Supper at Grand Hotel.

FRIDAY, JUNE 19TH.

*Incorporated Municipal Electrical Association.*

10 a.m. Birmingham Convention. Annual General Meeting at Midland Institute.

2.30 p.m. Visit to Summer Lane Power Station.

8 p.m. Cinderella Dance at Grand Hotel.

SATURDAY, JUNE 20TH.

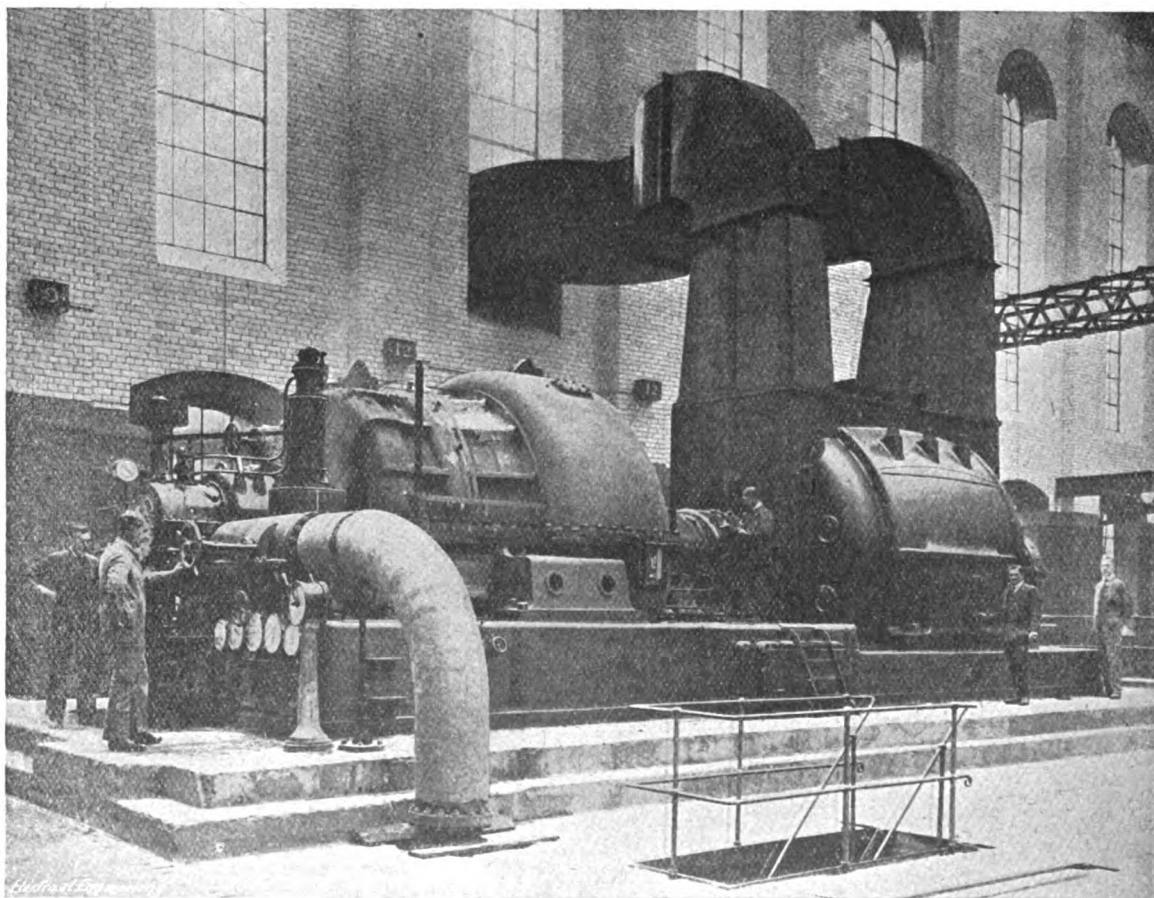
*Incorporated Municipal Electrical Association.*

10 a.m. Birmingham Convention. Visit to Worcester.

## A 15,000 KW. TURBO-ALTERNATOR AT MANCHESTER

THE most recent extension to the generating plant at the Stuart Street Station of the Manchester Corporation is the 15,000-kw. Howden-Siemens turbo-

further extension is in hand which is really a replacement, inasmuch as one of the original 1,500-kw. cross-compound vertical slow-speed Yates and Thom engines



15,000 KW. HOWDEN-SIEMENS TURBO-ALTERNATOR AT STUART STREET, MANCHESTER.

alternator which we illustrate here. With this addition, the capacity of the station is brought up to 55,000 kw. The engine-room is now practically full, although a

driving an A.E.G. alternator is being taken out for its space to be occupied by a 6,000-kw. turbo-alternator. When this has been accomplished, which will be about

the middle of 1915, no further extensions to the capacity of the Stuart Street Station will be possible. It is of interest to note that the units generated at Stuart Street last year were 123,388,190, and the maximum demand was 36,120 kw.

The main contractors for the set were James Howden & Co., Ltd. (Glasgow). The turbine is of the Zoelly impulse type, with 14 wheels, the largest overall diameter is nearly 9 ft. and the smallest nearly 8 ft. The shaft is 15½ in. at the journals and runs at 1,000 r.p.m. Main and emergency governors are fitted. All the bearings are water-jacketed, and are fitted with forced lubrication, in connection with which an oil cooler in the bed-plate is provided having no less than 820 square feet of cooling surface. The machine is designed to take steam at 190 lbs. per sq. in. at 600° F., and to exhaust into a 27½-in. vacuum.

The alternator to which it is directly coupled by a rigid coupling was made by Siemens Brothers Dynamo Works, Ltd., and its rated output is 15,000 kw. at 6,000 volts 50 cycles three-phase, with a temperature rise after six hours at full load not exceeding 60° F. on any part of the machine. The overload capacity is 19,000 kw. The stator is totally enclosed, and is wound with one mica insulated bar per slot. The rotor is of the cylindrical type, about 67 ins. diameter, made up of a central solid forging with steel rings shrunk over it. The windings are contained in equidistant slots. The total weight of the rotor is about 53 tons, and carries fans for axial ventilation. An external fan capable of delivering 53,000 cubic feet of air per minute, and driven by a 120 h.p. motor at 670 r.p.m., is also installed. Excitation is provided by a 220-volt shunt-wound exciter coupled to the end of the alternator shaft. As an alternative, excitation may be supplied from the station bus-bars. A wet-air filter has been supplied by the Sturtevant Engineering Co., but this works in parallel with dry-cloth air filters which had been previously installed.

The condensing plant was supplied by Richardsons, Westgarth & Co., Ltd. (West Hartlepool). The surface condenser, which is 11 ft. diameter by 16 ft. between tube plates, and is built up to ¾ in. mild steel plates, contains 6,550 tubes ¾ in. external diameter, giving a total surface of 24,000 sq. ft. Following the latest practice at Manchester, no main exhaust valve has been installed between the turbine and the condenser, but, in lieu thereof, arrangements have been made for flooding the steam space of the condenser whenever the set is exhausting to atmosphere. The air and water extracting pumps are of the kinetic type made by the Pulsometer Engineering Co., and consist of two units each equal to 60 per cent. of the capacity of the plant,

and driven by a 100-h.p. Richardson-Westgarth impulse steam turbine at 3,000 r.p.m. The whole of the exhaust steam from these turbines is utilised in the kinetic air ejectors and direct contact feed water heaters. The circulating water pumps are also divided into two units of similar proportions, and comprise a pair of multi-cellular centrifugal Rateau pumps each driven by a 600 h.p. Richardson-Westgarth impulse steam turbine. The guaranteed steam consumption per kilowatt-hour, with a power factor of 0.95, with a steam pressure at the stop valve of 190 lbs. per square inch at total temperature of 330° F. and a 27½-in. vacuum, are as follows:—¼ load, 16.95; ½ load, 14.92; ¾ load, 14.12; full load, 16.35; and 25 per cent. overload, 14.25. In considering these figures, it must be remembered that Stuart Street is a cooling-tower station, and therefore very high vacua are not obtainable.

The whole plant is to the specifications of Mr. S. L. Pearce, Chief Engineer to the Manchester Corporation Electricity Department, to whom our thanks are due for the information from which this description is prepared.

## THE INSTITUTION OF ELECTRICAL ENGINEERS AND THE SUFFRAGETTES

IT is greatly to be regretted that the Institution of Electrical Engineers should have thought fit to let a portion of a building in Tothill Street of which they are the landlords to the Women's Social and Political Union. The Institution, of course, knew to whom they were letting, and should have known that the Union is the central body organising the "militant suffragette" campaign—in fact, in a statement made at the Annual General Meeting of the Institution of Electrical Engineers last month (but suppressed in the Official Report in the *Journal*), Mr. Robert Hammond, who takes responsibility for the administration of the Tothill Street property on behalf of the Council, regarded it as a good joke that the arrangements had been made with "the suffragettes" for a short-period tenancy. The offices in question are now being used as the temporary centre from which the present destruction of churches, insults to the King, and other disorders are organised, and were raided by the police on Tuesday. We trust that the lease will be terminated by the Institution forthwith.

## MEMBERS AND VISITORS ATTENDING THE I.M.E.A. CONVENTION

(Strictly Copyright.)

THE following is a list of the members and invited guests who had intimated their intention of attending the Convention up to the time of our going to press yesterday. This list is to be taken in no way as "official," but every effort has been made to make it as complete and accurate as possible.

The abbreviation *Ch'n* stands for Chairman of the Electricity Committee, *C'r* for member of Electricity Committee, *E.E.* for Chief Electrical Engineer.

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| <p>Acland, R. L. (<i>E.E.</i>, Chesterfield).<br/>         Allen, P. R. (Castner-Kellner Alkali Co.)<br/>         Allen, S. T. (<i>E.E.</i>, Wolverhampton).<br/>         Annetts, A. W. (<i>E.E.</i>, Morecambe).<br/>         Ashlin, F. J. W. (<i>Resident Engineer</i>, Water Street, Birmingham).<br/>         Ashworth, J. (<i>Ch'n</i>, Heywood).<br/>         Atkinson, A. (Clarke Chapman &amp; Co.).<br/>         Ayton, F. (<i>E.E.</i>, Ipswich).<br/>         Ayton, R. (<i>E.E.</i>, Winchester).<br/> <br/>         Bache, W. J. (<i>E.E.</i>, Cheltenham).<br/>         Bacon, T. H. (<i>Ch'n</i>, Hammersmith).<br/>         Bailes, W. J. (<i>Ch'n Ltg Sub-Com.</i>, L'pool).<br/>         Bailey, R. U. (<i>Resident Engineer</i>, Summer Lane, Birmingham).<br/>         Ball, Ald. G. (Stockport).<br/>         Banton, Ald. (<i>Vice-Ch'n</i>, Leicester).<br/>         Barham, A. W. (<i>E.E.</i>, Watford).</p> | <p>Barker, E. A. (<i>E.E.</i>, Barnsley).<br/>         Barnard, A. S. (<i>E.E.</i>, Walsall).<br/>         Bastian, Jas. (Bastian Meter Co.).<br/>         Bates, J. S. (<i>C'r</i>, Coventry).<br/>         Bates, T. E. B. (<i>Ch'n</i>, Darlington).<br/>         Bates, Ald. W. T. (<i>Mayor, Ch'n</i>, Derby).<br/>         Baxter, T. (<i>C'r</i>, Greenock).<br/>         Beauchamp, J. W. (<i>E.E.</i>, West Ham).<br/>         Beckett, A. J. (<i>E.E.</i>, Bridlington).<br/>         Beecham, Sir J. (<i>Ch'n</i>, St. Helens).<br/>         Bell, H. (<i>E.E.</i>, Hull).<br/>         Bell, J. A. (<i>E.E.</i>, Aberdeen).<br/>         Bellamy, L. C. F. (<i>E.E.</i>, Ilkeston).<br/>         Belling, C. R. (Belling &amp; Co.).<br/>         Bemrose, J. (<i>E.E.</i>, Leek).<br/>         Bennett, R. (<i>Vice-Ch'n</i>, Dartford).<br/>         Bexon, W. C. (<i>E.E.</i>, Kilmarnock).<br/>         Billington, J. (<i>Ch'n</i>, Salford).<br/>         Bird, Ald. T. P. (<i>C'r</i>, Birmingham).<br/>         Blackman, A. S. (<i>E.E.</i>, Sunderland).<br/>         Blackwood, J. A. (Union Cable Co.).<br/>         Bland, A. V. (Chamberlain and Hookham).<br/>         Blascheck, C. A. (<i>E.E.</i>, Canterbury).<br/>         Bloxam, T. W. (<i>E.E.</i>, Belfast).<br/>         Blunt, W. W. (Westinghouse Co.).<br/>         Blyth, H. (Strachan and Henshaw).<br/>         Bolam, J. H. (<i>E.E.</i>, Weymouth).<br/>         Boot, H. (London).<br/>         Bowden, J. H. (<i>E.E.</i>, Poplar).<br/>         Briggs, W. (<i>C'r</i>, Lancaster).<br/>         Britton, S. E. (<i>E.E.</i>, Chester).<br/>         Brooking, J. H. C. (St. Helens Cable Co.).<br/>         Bruce, Ald. W. (<i>Ch'n</i>, Sunderland).<br/>         Brydges, J. K. (<i>E.E.</i>, Eastbourne).<br/>         Burnan, J. B. (<i>C'r</i>, Birmingham).<br/>         Burnett, H. R. (<i>E.E.</i>, Barrow-in-Furness).<br/>         Butler, C. McArthur (<i>Sec. I.M.E.A.</i>).</p> | <p>Callender, T. O. (Callender's Cable Co.).<br/>         Campion, R. H. (<i>E.E.</i>, Dewsbury).<br/>         Carr, L. S. (<i>Constr. Eng.</i>, Birmingham).<br/>         Chamberlain, John (Chamberlain &amp; Hookham).<br/>         Charlesworth, S. (<i>C'r</i>, Bridlington).<br/>         Chattock, R. A. (<i>E.E.</i>, Birmingham).<br/>         Christie, J. (<i>E.E.</i>, Brighton).<br/>         Clarke, D. J. (<i>Ch'n</i>, Birkenhead).<br/>         Clarke, Major R. J. (<i>Dep. Ch'n</i>, Liverpool).<br/>         Clayton, J. E. (<i>Ch'n</i>, Chesterfield).<br/>         Clegg, S. (<i>E.E.</i>, Lincoln).<br/>         Clothier, H. W. (A. Reyrolle &amp; Co.).<br/>         Clothier, J. H. (<i>E.E.</i>, St. Anne's-on-Sea).<br/>         Clothier, T. D. (<i>E.E.</i>, Bootle).<br/>         Coates, H. (Voigt &amp; Haefner).<br/>         Collis, A. G. (Crompton &amp; Co.).<br/>         Cooke, G. H. (Brown, Boveri &amp; Co.).<br/>         Cooke, W. F. (<i>Ch'n</i>, Nelson).<br/>         Cooke, W. H. (<i>E.E.</i>, Luton).<br/>         Cooper, A. G. (<i>E.E.</i>, Colne).<br/>         Coveney, A. (<i>E.E.</i>, Erith).<br/>         Craig, J. H. (Glasgow).<br/>         Cramb, A. C. (<i>E.E.</i>, Croydon).<br/>         Craven, G. F. (<i>Trans. Eng'r</i>, Reading).<br/>         Crawford, W. (Belliss &amp; Morcom).<br/>         Cridge, A. J. (Electrical Co.).<br/>         Crocker, E. (<i>Instal. Eng.</i>, Birmingham).<br/>         Cross, E. (<i>E.E.</i>, Rotherham).<br/>         Crow, Ald. W. (<i>Mayor</i>, West Ham).<br/>         Crowther, J. A. (<i>E.E.</i>, Wallasey).<br/>         Crowther, J. P. (<i>E.E.</i>, Workop).<br/>         Crowther, J. W. (<i>Ch'n</i>, Sheffield).<br/>         Curtis, E. W., Jun. (Gen. Elec. Vehicle Co.).<br/>         Davenport, F. R. (Willans &amp; Robinson).<br/>         Davidson, C. S. (<i>E.E.</i>, Barnes).<br/>         Davies, Ald. R. C. (<i>Ch'n</i>, Chester).</p> |
|---|---|---|

- De Renzi, A. J. C. (*E.E.*, Newcastle-under-Lyme).
- Deverill, A. G. (Brush El. Eng. Co.).
- Dexter, W. A. (Mirrlees Watson Co.).
- Dickinson, H. (*E.E.*, Liverpool).
- Duesbury, T. (*E.E.*, Sutton Coldfield).
- Dymond, E. R. (*Ch'n.*, Hereford).
- Eck, Justus (Union Electric Co.).
- Ellaway, A. G. (*Ch'n.*, Birmingham).
- Ellis, A. (*E.E.*, Cardiff).
- Ellis, H. S. (*E.E.*, S. Shields).
- Ellis, J. E. (*E.E.*, Morley).
- Eunson, D. M. (*E.E.*, Cambuslang).
- Everest, A. R. (B.T.-H. Co.).
- Eyre, G. W. (*Ch'n.*, Plymouth).
- Farr, J. (*C'r.*, Nottingham).
- Fawcett, A. (*C'r.*, Halifax).
- Fedden, S. E. (*E.E.*, Sheffield).
- Ferguson, R. F. (*E.E.*, Hastings).
- Finnigan, Ald. J. S. (*C'r.*, Belfast).
- Flint, Ald. S. (*Ch'n.*, Leicester).
- Forbes, R. H. D. (Jandus Arc Lamp Co.).
- Forrest, F. (*Sub-station Engineer*, Handsworth, Birmingham).
- Foulds, H. (*Sec. Elec. Dept.*, Birmingham).
- Freir, W. E. (*Light Rly. & Tram. Jnl.*).
- Friederichs, H. F. (*E.E.*, West Hartlepool).
- Frisby, W. (*E.E.*, Colchester).
- Furness, C. (*E.E.*, Blackpool).
- Gatehouse, T. E. (*Electrical Review*).
- Gauntlett, R. W. (Bruce, Peebles & Co.).
- Gervis, Dr. H. (*Ch'n.*, Brighton).
- Gibb, T. (*Ch'n.*, Aberdeen).
- Gibbings, Ald. W. P. (*Ch'n.*, Carlisle).
- Gibbs, J. H. (*C'r.*, Bristol).
- Gibson, R. (*Ch'n.*, Wolverhampton).
- Gibson, S. C. (*E.E.*, Nuneaton).
- Gill, J. C. (*E.E.*, Peterborough).
- Gillespie, M. M. (Gillespie & Beales).
- Gower, W. E. (Underfeed Stoker Co.).
- Grant, H. R. (*Ch'n.*, Motherwell).
- Gray, H. (*E.E.*, Accrington).
- Gregory, J. P. (B.T.-H. Co.).
- Groves, W. E. (*Mains Eng.*, Birmingham).
- Hale, K. O. (Sturtevant Eng'g Co.).
- Haley, J. (*C'r.*, Bradford).
- Hall, T. (*E.E.*, Burton-on-Trent).
- Hannay, Bailie W. (*Vice-Ch'n.*, Glasgow).
- Hargreaves, J. W. (*C'r.*, Burnley).
- Harrison, Haydn T. (London).
- Harrop, J. (*C'r.*, Morley).
- Hawker, F. (*C'r.*, Birmingham).
- Heald, Ald. J. (*Ch'n.*, Lancaster).
- Heath, — (*C'r.*, Birmingham).
- Hewlett, E. (*E.E.*, Mansfield).
- Hickling, Ald. G. (*C'r.*, St. Pancras).
- Hill, Clement (*Ch'n.*, Hastings).
- Hinde, W. (*C'r.*, Whitehaven).
- Hoadley, E. E. (*E.E.*, Maidstone).
- Hobdell, W. F. (Hobdell, Way & Co.).
- Hogarth, L. B. (*E.E.*, Whitehaven).
- Holden, E. (Birmingham).
- Holden, P. (Ferranti, Ltd.).
- Hollingsworth, E. M. (*E.E.*, St. Helens).
- Holmes, W. (*E.E.*, Barking).
- Holt, T. (*Dep. Ch'n.*, Bury).
- Homer, J. F. (*C'r.*, Birmingham).
- Honebon, Ald. T. (*Ch'n.*, Weymouth).
- Huddleston, J. S. (Siemens Bros. & Co.).
- Hurlbatt, E. S. (Dick, Kerr & Co.).
- Ireland, A. J. (B.T.-H. Co.).
- Jackson, W. A. (*E.E.*, West Bromwich).
- Jacob, E. S. (Tudor Accumulator Co.).
- Jamieson, W. (*Ch'n.*, Bury).
- Jephcott, Ald. A. R. (*C'r.*, Birmingham).
- Jewell, E. J. (E. Green & Son).
- Johnson, Ald. P. (*Vice-Ch'n.*, Hammersmith).
- Jones, S. D. (*E.E.*, Batley).
- Jowett, W. H. (*Ch'n.*, Morley).
- Kaula, R. J. (Willans & Robinson).
- Kay, Barnes (*E.E.*, Haslingden).
- Kennedy, R. W. (*Electrical Industries*).
- Kerr, W. T. (*E.E.*, Hereford).
- Kilburn, J. E. (*Ch'n.*, Dewsbury).
- Kilpin, Ald. S. L. (*Ch'n.*, Bedford).
- King, F. W. (*Ch'n.*, Bootle).
- King, J. H. (*C'r.*, Burton-on-Trent).
- Koch, Dr. W. (Electrical Co.).
- Lacey, E. M. (London).
- Lackie, W. W. (*E.E.*, Glasgow).
- Lawson, W. (*Meter & Motor Sup't.*, B'ham).
- Leach, R. B. (*E.E.*, Heywood).
- Lee, F. (*Ch'n.*, Coventry).
- Lee, H. Tomlinson (*E.E.*, Wimbledon).
- Leese, Ald. H. (*Ch'n.*, Stoke-on-Trent).
- Leicester, Ald. H. A. (*Mayor of Worcester*).
- Leigh, R. (*C'r.*, St. Anne's-on-Sea).
- Littler, Ald. H. W. (*Ch'n.*, West Ham).
- Lloyd, Ald. S. (*Dep. Ch'n.*, Bristol).
- Long, E. D. (*E.E.*, Grays).
- Long, F. M. (*E.E.*, Norwich).
- Longworth, Ald. W. (*Ch'n.*, Bolton).
- Lonsdale, W. S. (Siemens Dynamo Works).
- Lunn, J. R. P. (*E.E.*, Darlington).
- Macallum, D. (*C'r.*, Greenock).
- McDonnell, J. L. (*C'r.*, Belfast).
- McDougall, J. P. (*Vice-Ch'n.*, Salford).
- McInnes, C. F. (*E.E.*, Gravesend).
- Mackay, H. F. S. (Stirling Boiler Co.).
- Mackersie, J. Y. (*Res. Eng.*, Aston B'ham).
- Macrory, R. V. (*E.E.*, Londonderry).
- Madgen, W. L. (B.E.T. Co.).
- Manton, Sir H. (*C'r.*, Birmingham).
- Marks, E. C. R. (*C'r.*, Birmingham).
- Martin, Ald. M. (*Ch'n.*, Eastbourne).
- Masters, F. H. (*Electrician*).
- Mathias, F. V. L. (*E.E.*, Warrington).
- May, W. R. (*E.E.*, Lowestoft).
- Merrett, W. J. (*Ch'n.*, Cheltenham).
- Meyers, P. F. (*Ch'n.*, Heston & Isleworth).
- Middleley, H. E. (Fraser & Chalmers).
- Miller, Ald. D. B. (*Ch'n.*, Croydon).
- Miller, W. H. (*E.E.*, Fleetwood).
- Milnes, G. C. (*E.E.*, Lancaster).
- Milns, W. E. (*Com'l. & Cons'rs Eng.*, B'ham).
- Milton, C. O. (*E.E.*, Maidenhead).
- Moore, A. N. (*E.E.*, Newport, Mon.).
- Moore, E. S. W. (Rees Roturbo Mfg. Co.).
- Morgan, J. (*C'r.*, Kingston-on-Thames).
- Morshhead, L. R. (L. R. Morshhead & Co.).
- Mortimer, G. (British Aluminium Co.).
- Nairn, Bailie J. M. (*Ch'n.*, Dundee).
- Nalder, F. H. (Nalder Bros. & Thompson).
- Nash, E. A. (Faraday House).
- Nayler, G. F. (*E.E.*, Nelson).
- Nevill, H. A. (*E.E.*, Wakefield).
- Newington, F. A. (*E.E.*, Edinburgh).
- Nield, F. A. (Aron Elec. Meter, Ltd.).
- Nuttall, Ald. A. (Blackburn).
- Okell, E. G. (*E.E.*, Plymouth).
- Owen, Thos. (Ed. Bennis & Co.).
- Papworth, J. W. (*E.E.*, Stirling).
- Partington, G. E. (W. T. Glover & Co.).
- Pauls, S. (*E.E.*, Middleton).
- Pearce, S. L. (*E.E.*, Manchester).
- Pearson, A. (*C'r.*, Dewsbury).
- Pearson, Ald. G. (*Ch'n.*, Bristol).
- Pearson, H. A. (Reason Mfg. Co.).
- Pearson, Ald. W. (*Ch'n.*, Eccles).
- Pember, J. D. (*E.E.*, Dartford).
- Phillips, R. W. L. (*E.E.*, Bedford).
- Pickvance, W. G. (*E.E.*, Wrexham).
- Pipkin, C. (Callender's Cable Co.).
- Plumtree, J. S. (Union Elec. Co.).
- Poole, E. (Hayle, Cornwall).
- Potts, A. (*C'r.*, Bolton).
- Pritchard, R. (*C'r.*, Liverpool).
- Proctor, H. Faraday (*E.E.*, Bristol).
- Purse, F. W. (*E.E.*, Carlisle).
- Pybus, J. (*C'r.*, Hull).
- Pybus, P. J. (Phoenix Dynamo Co.).
- Rand, P. N. (Westinghouse Co.).
- Ranson, H. (*E.E.*, Falkirk).
- Raphael, F. C. (*Electrical Engineering*).
- Rayner, E. S. (*E.E.*, Doncaster).
- Reading, — (*C'r.*, Birmingham).
- Redman, W. (*E.E.*, Shipley).
- Reeves, T. (*Dep. Ch'n.*, Rotherham).
- Renfree, T. R. (British Elec. Trans. Co.).
- Reynolds, E. (*C'r.*, Shipley).
- Richardson, H. (*E.E.*, Dundee).
- Robertson, G. M. (*Ch'n.*, Fleetwood).
- Robertson, J. A. (*E.E.*, Salford).
- Robertson, J. K. (Strachan & Henshaw).
- Robson, W. (Jandus Arc Lamp Co.).
- Robinson, Ald. G. H. (*Ch'n.*, Bradford).
- Robinson, I. V. (Richardsons, Westgarth).
- Rogerson, W. M. (*E.E.*, Halifax).
- Roles, T. (*E.E.*, Bradford).
- Rolling, B. I. (Glasgow).
- Russell, H. S. (Mirrlees, Bickerton & Day).
- Rutherford, A. P. (*E.E.*, Leith).
- Rycroft, P. (*E.E.*, Heston & Isleworth).
- Salt, C. W. (*E.E.*, Torquay).
- Schofield, Ald. J. (*Vice-Ch'n.*, Stoke-on-Trent).
- Schofield, R. H. (Ferranti, Ltd.).
- Scholey, H. (Scholey & Co.).
- Seabrook, A. H. (*E.E.*, St. Marylebone).
- Selvey, W. M. (Sheffield).
- Senior, J. (*E.E.*, Mexborough).
- Shallcross, G. P. (*E.E.*, Birkenhead).
- Sharp, E. E. (Venner & Co.).
- Shaw, A. H. (*E.E.*, Ilford).
- Shaw, C. M. (*E.E.*, Worcester).
- Shawfield, C. E. C. (Knowles Oxygen Co.).
- Sims, P. J. (General Electric Co., Glasgow).
- Sinclair, A. (*Ch'n.*, Swansea).
- Smith, Ald. J. P. (*Ch'n.*, Barrow-in-Furness).
- Smith, E. S. (British Elec. Equipment Co.).
- Smith, Ald. F. (*Ch'n.*, Liverpool).
- Smith, Ald. G. (*C'r.*, Doncaster).
- Smith, J. J. (*E.E.*, Stockton-on-Tees).
- Smith, R. W. (Drake & Gorham).
- Smith, T. R. (*E.E.*, Leicester).
- Smith, Bailie W. B. (*Ch'n.*, Glasgow).
- Snell, J. F. C. (London).
- Staniland, N. (*E.E.*, Hornsey).
- Stansfield, J. W. (*C'r.*, Rawtenstall).
- Starkie, J. E. (*E.E.*, Burnley).
- Starmer, C. W. (*C'r.*, Darlington).
- Statler, J. G. (Switchgear & Cowans).
- Stewart, C. L. E. (*E.E.*, Rawtenstall).
- Stirling, P. (*Mayor, Ch'n.*, Doncaster).
- Stone, G. D. (Mirrlees, Watson Co.).
- Stuart Dudley (*Ch'n.*, Wimbledon).
- Symonds, P. H. (Willans & Robinson).
- Taite, C. D. (Lancashire Electric Power Co.).
- Tapp, B. A. (*Electrical Review*).
- Tapper, J. E. (*E.E.*, Beckenham).
- Tapper, W. C. P. (*E.E.*, Stepney).
- Taylor, A. M. (*Asst. Eng.*, Birmingham).
- Teasdel, J. E. (*E.E.*, Pontypriid).
- Thomas, Bertram (Manchester).
- Thomson, A. (*Ch'n.*, Ayr).
- Thomson, C. S. (Vickers, Ltd.).
- Tonkins, Major H. (*Ch'n.*, Stockton-on-Tees).
- Tomlinson, L. (*Dep. Ch'n.*, Bootle).
- Torpy, R. N. (*E.E.*, Tunbridge Wells).
- Tough, G. (*E.E.*, Coventry).
- Tudman, A. R. (*E.E.*, Colwyn Bay).
- Turnbull, C. (*E.E.*, Tynemouth).
- Turney, A. T. (Western Electric Co.).
- Vaudrey, J. C. (Birmingham).
- Vaughan, E. Ald. (*Ch'n.*, Maidstone).
- Verdie, A. (Craigpark Elec. Cable Co.).
- Vignoles, W. A. (*E.E.*, Grimsby).
- Walker, J. (*C'r.*, Hull).
- Warrilow, W. E. (*Electrician*).
- Watson, S. J. (*E.E.*, Bury).
- Way, F. H. (Electrical Apparatus Co.).
- Webb, H. J. Groves (Electrical Co.).
- Webster, A. (*Electrical Engineering*).
- West, Ald. C. (*C'r.*, Coventry).
- Wheelwright, P. P. (*E.E.*, Blackburn).
- Wilkinson, G. (*E.E.*, Harrogate).
- Wilkinson, H. (*E.E.*, Radcliffe).
- Wilkinson, H. T. (Wardle Eng. Co.).
- Wilkinson, T. (*C'r.*, Lancaster).
- Willcox, A. M. (*Tram. & Rly. World*).
- Willock, Bailie J. (*C'r.*, Glasgow).
- Wilmshurst, T. P. (*E.E.*, Derby).
- Wilson, C. (Osram Lamp Works).
- Wilson, Ald. J. H. (*Ch'n.*, Hornsey).
- Wilson, R. J. (*Vice-Ch'n.*, Sunderland).
- Wishart, J. A. (*E.E.*, Motherwell).
- Womersley, H. (*Ch'n.*, Wakefield).
- Wood, A. P. (Lancashire Dynamo Co.).
- Wood, W. C. (*C'r.*, St. Pancras).
- Wood, W. J. H. (*E.E.*, Bolton).
- Woodman, L. W. (*E.E.*, Dover).
- Wordingham, C. H. (Admiralty).
- Wyld, W. (*E.E.*, Hampstead).
- Yeaman, C. H. (*E.E.*, Stoke-on-Trent).



## ANNUAL CONVENTION OF THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION

**T**HE Incorporated Municipal Electrical Association will hold its Nineteenth Annual Convention from Tuesday to Friday next week in Birmingham, Coventry, and Stratford-on-Avon. The headquarters will be at the Grand Hotel, Birmingham, and a time-table of the meeting and visits to works, which include the Summer Lane power station of the Birmingham Corporation, General Electric Co., Belliss and Morcom, Daimler Co., and the Coventry and Worcester Corporation Electricity Works, will be found in our "Arrangements for the Week" column on p. 316. In accordance with our usual custom, we give below portraits and brief biographical notices of the President and the readers of papers, and we also publish descriptions of the features of interest in the works to be visited.

Mr. R. A. CHATTOCK, the President, has been Chief Electrical Engineer to the Birmingham Corporation since 1903, when he resigned a similar position at Bradford to which he was appointed three years previously. At the time he went to Birmingham, the conditions of electric supply were capable of vast reorganisation, and the work of carrying this out has occupied so

in this matter, and for this reason in the past has been a supporter of the I.M.E.A. Bill. It is not improbable that his Presidential Address will make some reference to this question.

Mr. W. A. VIGNOLES, Chief Electrical Engineer to the Grimsby Corporation, was one of the first among central station engineers to realise the importance of systematic advertising and the running of a publicity department. Therefore his Paper on Tuesday on "The Commercial Development of Electrical Supply in Towns of Moderate Size" comes from one who may be termed a pioneer in this branch. His frequent speeches at I.M.E.A. Conventions have always been to the point and invariably impart useful information. The success of his methods are demonstrated by the last accounts of the Grimsby Electricity Department, a much larger profit having been earned than was estimated, notwithstanding the high price of coal and large payments out of revenue for mains and meters. He has been in charge at Grimsby since 1901.

Mr. S. E. FEDDEN, General Manager and Chief Engineer of the Sheffield Corporation Electricity Department, who will read a Paper in Coventry on Wednesday on "The Design and Operation of Modern Boiler-House Plant," is another well-known speaker at I.M.E.A. Conventions. He has been at Sheffield since 1900, and has made a great reputation for the manner in which he has developed the undertaking, particularly in the direction of power supply, in face of the competition of gas supplied in the region of 1s. per thousand cu. ft.



THE PRESIDENT.  
R. A. CHATTOCK.



W. A. VIGNOLES.



S. E. FEDDEN.



J. H. BOWDEN.

much time that Mr. Chattock has had little opportunity for much else. His first step was the design of the Summer Lane power station, which was only completed last year, but the development has been so rapid that a new 100,000-kw. power house is now in hand. Once again Mr. Chattock is responsible for the complete design. His broadmindedness appeals to the electrical contractors of Birmingham, for although he has full wiring powers they are not exercised, he having expressed his entire satisfaction with the work carried out by Birmingham contractors. At the same time Mr. Chattock is prepared to take up the cudgels on behalf of those towns not so favourably situated

Mr. J. H. BOWDEN, Chief Engineer to the Poplar Borough Council, reads a Paper at Stratford-on-Avon on Thursday dealing with the Standardisation of Tariffs, a subject which comes up afresh with every increase of the efficiency of incandescent lamps. Unlike the other authors, Mr. Bowden has never previously read a Paper at an I.M.E.A. Convention, and has seldom spoken. He has given considerable attention to the question of tariffs in recent years, and the Paper may be expected to contain the results of his experience. Mr. Bowden has been Engineer-in-Chief at Poplar since 1904, and has been responsible for the various extensions since that date.



## WORKS TO BE VISITED

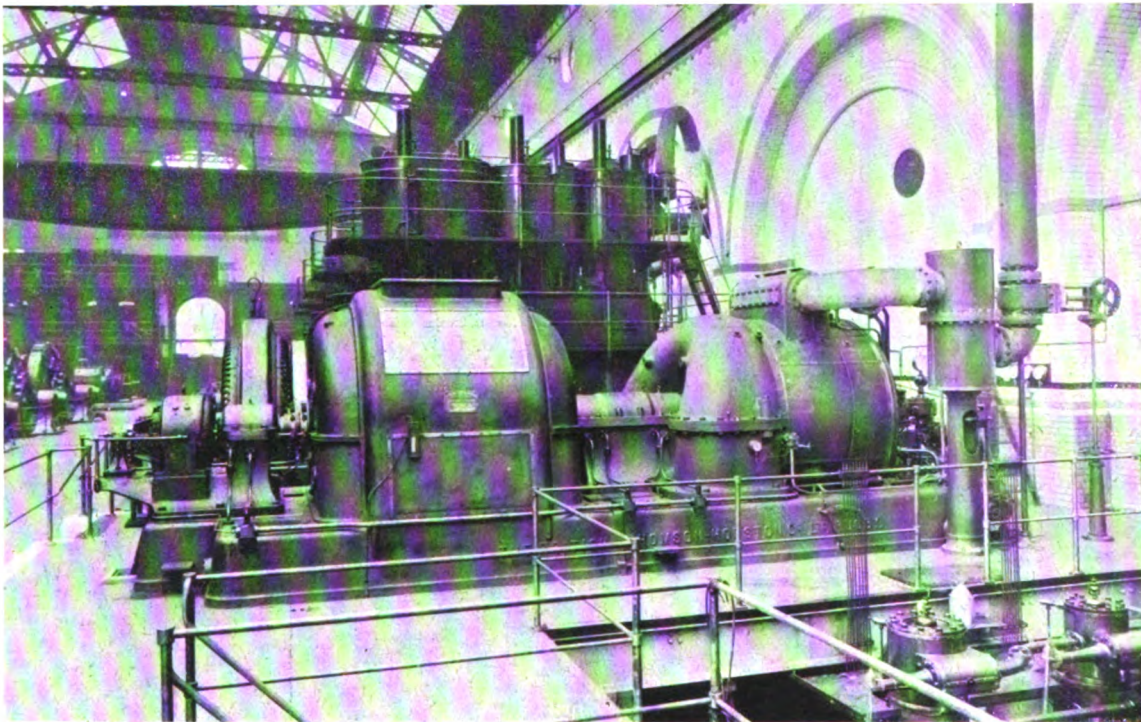
## THE SUMMER LANE ELECTRICITY WORKS OF THE BIRMINGHAM CORPORATION

THE electric supply of Birmingham has been carried on by the Corporation since 1900, when the two stations at Dale End and Water Street of the Birmingham Electric Supply Co. were taken over. The load, however, increased so rapidly that it was soon necessary to build an entirely new station, with the result that the Summer Lane Electricity Works, which will be thrown open to inspection on Tuesday, and is also down on the programme to be formally visited on Friday, was opened in 1906, at a site which, although near the centre of the town, is convenient as regards condensing water and canal-borne coal. So rapid has been the continuance of the growth of the load since then that history is about to repeat itself, and yet another new station is in progress at Nechells.

From the Summer Lane station three kinds of supply are given: a three-wire D.C. supply at  $2 \times 220$  volts, a 550-volt tramway supply, and a 5,000-volt three-phase supply to the more

factor of 0.66; they generate at 5,000 volts, 3 phase, 25 cycles. Each is provided with its own exciter, but the small continuous-current turbo sets mentioned above are available for standby excitation purposes. A point of interest in the rows of Belliss engine sets is the way in which the condensers are arranged between the engines, so that any engine can exhaust into the condenser on either side of it. The new turbo sets have, as usual, their own condensing plant under them; the air pumps are of the Edwards type but are steam driven, but the circulating pumps and practically all other auxiliaries in the station are electrically driven.

The boiler-house runs parallel with the engine-room on one side only, so that for the further row of plant rather long steam pipes are required; these pass under the engine-room floor. The boilers—all of the Babcock & Wilcox type—have gradually increased in number as the new generating plant has been put in, and it is interesting to note how in the matter of floor space it has overtaken the generating plant as more and more compact sets have been put in, so that extensions of the boiler-house were required but not of the engine-room. The whole of the stoker shafts and other boiler auxiliaries can be driven either by motors or by standby steam engines, and in the same way both steam and electric feed pumps are provided. All coal is canal borne, and a very ample coal-conveying plant is installed. This plant was supplied by the New Conveyor Co., Ltd. (Smethwick), and its principal feature is a bucket conveyor



THE ENGINE ROOM AT SUMMER LANE, SHOWING ONE OF THE NEW TURBO-ALTERNATORS, WITH THE OLDER RECIPROCATING PLANT IN THE BACKGROUND.

outlying districts. The general arrangement of the engine-room, which is 275 ft. long by 100 ft. wide, is the placing of the continuous-current sets on one side of the room and the alternators on the other. This imposing double row of plant gives a particularly spacious effect. The original main sets on both sides were of 1,500 kw. capacity, with Westinghouse and Dick, Kerr generators, all driven by triple expansion Belliss engines, four in number on the D.C. side, and two in number on the A.C. side. There are also two 500-kw. D.C. Parsons turbo-generators which were removed from Dale End, and three 500-kw. Dick, Kerr alternators driven by Belliss engines. Several further units of the same kind were subsequently added, but in the meantime such was the progress of the steam turbine that, long before the engine-room was full, the installation of reciprocating plant was discontinued. The next extension took the form of an exhaust steam turbine added to one of the latest Belliss-Dick, Kerr alternator sets, another was fitted in so that no extra floor space was required. More recently two 5,000-kw. turbo-alternators, one of which is seen in the illustration, were put in, bringing the total capacity of the station up to 36,500 kw. The small floor space that these occupy for their output relatively to the older plant is very striking. These two sets were supplied by the British Thomson-Houston Co. (Rugby). The turbines are of the six-stage horizontal Curtis type. The alternators are capable of an output of 7,500 k.v.a. at a power

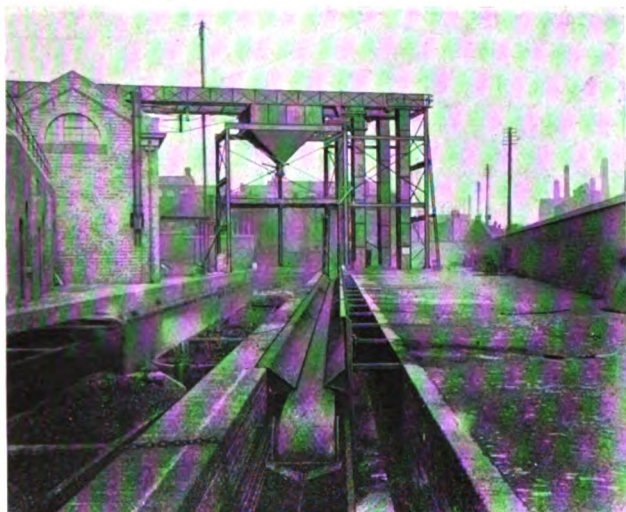
passing over the top of the boiler house for the supply of coal, and on its return journey running underneath for the conveyance of ashes. It is 2,000 ft. in length, and has a capacity of 40 tons per hour. This conveyor receives coal at the canal side from shoots which discharge from a collecting box fed by the belt shown in the illustration, which receives the coal from the barges.

With these vast extensions of plant it became no longer possible to rely only on the canal for cooling of the condensing water, and a group of 12 large cooling towers was accordingly erected. These towers, which were supplied by the Worthington Pump Co., are of the cylindrical steel pattern, and each is capable of dealing with 125,000 gallons of water per hour.

The switchgear is all concentrated at one end of the station, and, considering the various kinds of supply given, is naturally somewhat extensive, although it can hardly be called complicated. Practically the whole equipment is of the British Thomson-Houston Co.'s manufacture. The same general idea is followed as in the engine-room of keeping the continuous-current gear on one side, and the A.C. gear on the other. The continuous-current gear is on a large scale, and provides for both the 550-volt traction supply and the feeders to the 440-volt supply, and it may be mentioned here that any D.C. generator can be run either compound at 550 volts, or shunt at 460 to 520 volts. There is also provision for control of the necessary



feeder boosters and balancers, a battery, the motor-generator, which acts as the connecting link between the traction and lighting bars, so that one can be supplied by the other if



COAL-HANDLING PLANT AT SUMMER LANE.

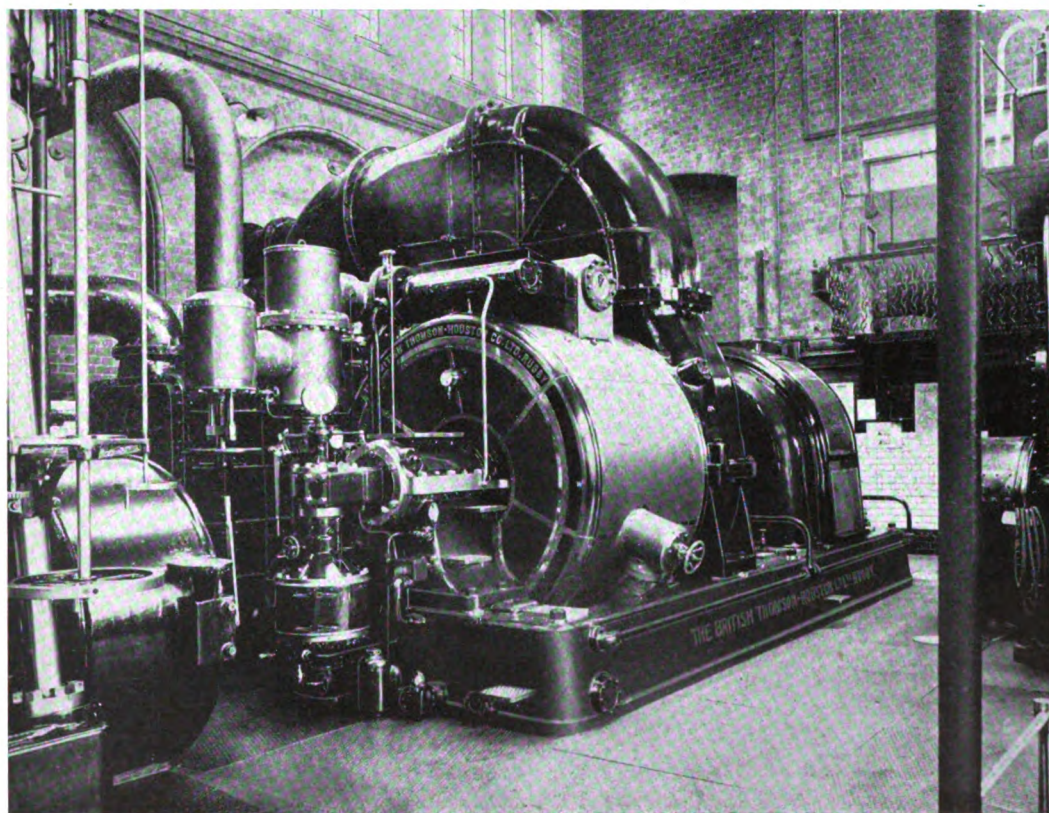
necessary, and the rotary converters, which in like manner connect the D.C. and A.C. sides of the station. A large number of D.C. outgoing feeders are provided for. Everything, including the changing over of the generators from shunt to compound, is done on the board, so that there are large quantities of heavy cables from the machines to the board. These are taken through a spacious cable subway under the engine-room floor, which is one of the special features of the station. The alternating-current gear is in many ways simpler and presents a fine example of remote-control H.T. oil-switch equipment, with a particularly conveniently-arranged desk-pattern control-board.

of the other substations. The old Water Street Station still contains a certain amount of steam plant, but ultimately the whole generation will be done at Summer Lane and Nechells. The whole undertaking is a monument to the skill and foresight of Mr. R. A. Chattock (City Electrical Engineer), from whose designs the Summer Lane Station was built, and, as President of the I.M.E.A., he may justly be proud in showing his friends round one of the finest stations in the kingdom.

### THE COVENTRY ELECTRICITY WORKS

THE first visit arranged for Wednesday afternoon is to the Electricity Works of the Coventry Corporation, where members will see a station which has been much changed, as its equipment has gradually been increased in output and in which turbo-generators of large size and modern design are gradually displacing the older reciprocating sets. The undertaking, which generates two-phase current only, has many points of interest, and the way in which the cost of generation is declining as the load is increasing reflects great credit upon Mr. George Tough, engineer and manager.

The original rope-driven single-phase plant started up in 1895 has now all been renewed to make room for larger units, and the original engine room, which at one time was filled by plant having a total capacity of 750 kw., at present contains plant totalling 11,000-kw. capacity. In November, 1902, 2-600-k.v.a., 2-phase, 50 cycle, 2,000-volt generators were installed by the British Schuckert Co., and the conversion from a single-phase 87 cycle, to a 2-phase 50-period system, was commenced. These generators are of the flywheel type, running at 125 r.p.m., directly coupled to marine-type engines with self-contained condensing gear by J. & H. McLaren (Leeds). These sets were followed by further sets of 2,600, 2,800, and 1,600 k.v.a., with Schuckert-Siemens and Westinghouse alternators, respectively, all driven by McLaren triple expansion engines similar to those previously installed. The latest stage of development commenced in April, 1910, when a 2,750-k.v.a. 2-phase horizontal Curtis turbo-generator was installed by the British Thomson-



ONE OF THE NEW TURBO-ALTERNATORS AT COVENTRY.

The various public substations, including those in the districts of Aston and Handsworth recently absorbed into the Birmingham area, are, we believe, 14 in number, and contain rotary converters aggregating some 22,000 kw. There are also over 100 substations on the premises of large-power consumers. The former Dale End Station is now entirely a substation, and serves also as a D.C. distributing centre. It contains converting plant of a capacity of 3,000 kw., a number of boosters, and a 7,000-ampere-hour battery. Batteries are also installed in some

Houston Co., Ltd., the machine being designed to give its output at 2,100 volts, and a power factor of 0.8 when running at 1,500 r.p.m. This set was closely followed by two additional turbo-generators of the same type and capacity. The condensing and pumping gear for these machines is of the Workington Pump Co.'s manufacture, and owing to the nearness of water to the surface of the engine room basement, the arrangement is adopted of placing the condenser on the engine room floor alongside each machine, instead of the more usual position



directly beneath the turbines. The exhaust steam had thus to be conveyed to the condensers by overhead exhaust pipes which give the sets an unusual appearance, as shown in the photograph reproduced here. The air and circulating water pumps are electrically driven.

In order to utilise to the fullest extent for cooling purposes the canal on the side of which the works are situated, the circulating water is conveyed from the condensers along a 36-in. steel pipe line to a point situated about 300 yards from the inlet screens. With increasing loads, however, the cooling effects ultimately proved inadequate, and four Worthington steel cooling towers, each dealing with 125,000 gallons per hour, have therefore been installed for this purpose. The pipe was constructed by Messrs. Stewarts and Lloyds, Ltd., and is composed principally of 28-ft. lengths of patent locking bar wrought steel pipes.

The present switchboard, which stands in the same position previously occupied by two other boards, was supplied by the British Westinghouse Co., Ltd., and is of the remote-controlled, mechanically operated type, with the control panels placed in a gallery directly above the granolithic switch cubicles contained in a room on the ground floor. No switching is effected on the neutral conductors, these being permanently connected to earth. An extension to the switchboard has recently been completed, to accommodate additional feeders, and to enable the older board to be converted into a feeder board divided into two sections, and supplied through group switches from the new board, to which the turbo-generators have been connected.

The boiler house contains eight Babcock & Wilcox tube boilers, and four Lancashire boilers, all fitted with Bennis automatic stokers. Local water-borne coal is used, and the deliveries are checked by an automatic weighing machine. The coal to and from this machine is mechanically transported to the various

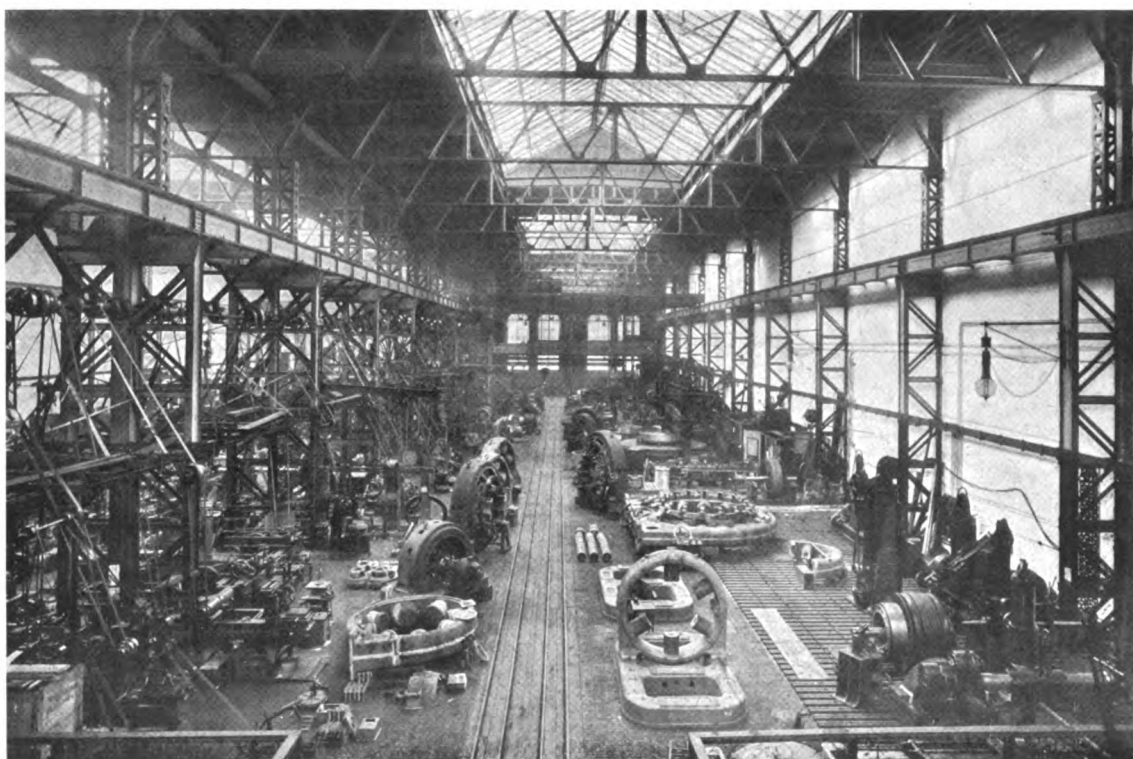
To give an idea of the magnitude and nature of the load, it may be said that, during the year ended March 14th last, 16,508,338 units were sold, of which no fewer than 14,932,800 were for power. The load factor was 20·4 per cent. Typical load curves show a winter maximum demand of 3,575 kw. and a summer maximum demand of 5,300 kw., but a record load of 9,240 kw. has been observed. The total costs per unit metered for last year (not including capital charges) amounted to 0·717d., of which actual works costs accounted for 0·239d.

### THE WITTON WORKS OF THE GENERAL ELECTRIC CO.

ONE of the most interesting visits during the Convention will be that to the group of works of the General Electric Co., Ltd., at Witton, Birmingham, on Tuesday afternoon, where the Company have their main engineering works for the manufacture of heavy electrical plant, switchgear, arc lamps, &c., the adjoining newer shops for fans, small motors, &c., their conduit factory, their central stores, and the famous carbon works, the only one of its kind in England. Unfortunately, however, the last mentioned, at which important work for the Admiralty is carried on, is not open to visitors.

#### The Witton Engineering Works.

The principal part of this works, which was established in 1900, is the large single shop illustrated here, in which the



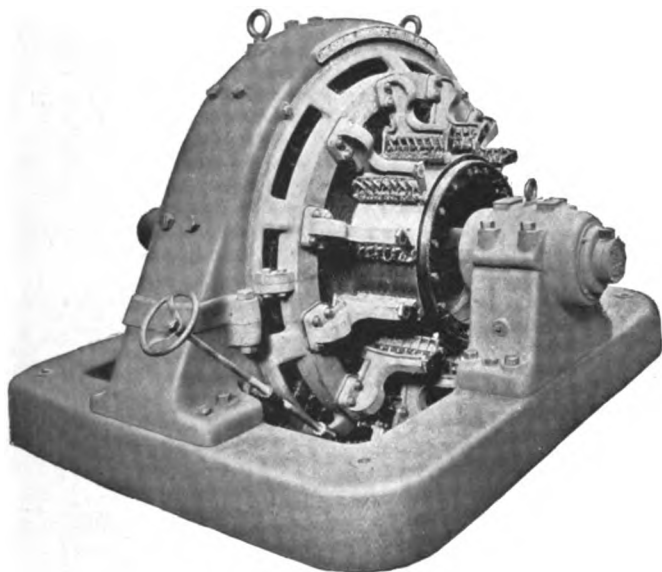
ONE OF THE ERECTING BAYS IN THE MAIN SHOP OF THE WITTON WORKS.

bunkers and boiler hoppers by Bennis elevators and distributors. Two Harris-Anderson separators are used for removing grease from the feed water, and a Kennicott softener for treating the canal water are used for making up the "feed" supply. With the exception of the boiler feed pumps, which are Weir's direct-acting steam pumps, the whole of the boiler-house auxiliary gear is electrically driven.

The underground cables in use here are either of the concentric or twin concentric type, paper insulated, and lead covered. Generally these are drawn into single 3-in. earthenware pipes, provided with "Stanford" joints. The low-pressure mains are supplied from a number of static transformer sub-stations stepping down to 200 watts. Large power consumers obtain their supplies from sub-stations erected on their own premises, and the equipment has to be purchased by the consumer before he becomes entitled to the special bulk supply rate. During the year ending March 31st last, 25½ miles of cable were laid, bringing the total length of cable in service up to approximately 140 miles.

whole of the dynamo and large motor work construction is carried on. The machine shop, erecting shop, and winding department all find accommodation in the spacious bays of this large shop, which is 350 ft. long by 210 ft. wide. At the present time a large amount of work is going through, and at almost every point machinery may be seen in course of construction indicating the present trend of heavy electrical engineering practice. Particular interest attaches to the numerous turbo-alternators going through, and there are many details which are worthy of attention, such as the way in which the slots in the rotors are milled separately out of the solid steel bodies, and in the methods adopted for cooling these machines. Efficient ventilation of the stator windings is assured by the slots being made deeper than the coils, so that an empty space is left behind them for the circulation of air. Another unique feature is the use of separate fans, one at each end of the rotor to cool the stator and rotor respectively. Attention should also be called to a group of four 750 kw. rotary converters destined for Southwark, to be used in

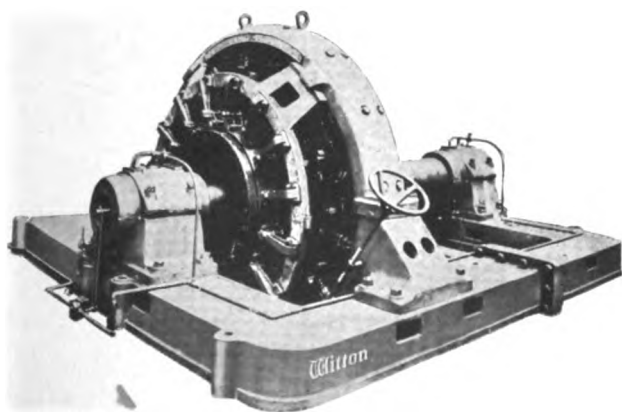
conjunction with two 1,500 kw. turbo-alternators for giving D.C. supply. There is a good deal of discussion going on just now as to the relative economy in using geared turbines for this class of works, as is done at the Horseferry Road station at Westminster (see ELECTRICAL ENGINEERING, May 21st, page 279), and it is interesting to find a case where A.C. generation with rotary converters has been decided upon. One of these rotary converters is illustrated here. Another machine worthy of remark is the large continuous-current rolling mill motor, also illustrated, which is for a Lincolnshire steel works. Attention should be drawn to the lubricating system worked by a small chain-driven pump. Some special mining motors will also be seen, with sealing boxes for the terminal connections attached to the frames of the machines. The company's standard practice is to bring out both ends of each winding of the three-phase stators to six terminals, which is a great



750 KW. ROTARY CONVERTER FOR USE IN CONJUNCTION WITH TURBO-ALTERNATOR AT SOUTHWARK.

convenience for locating any damage that may be done to the coils. A special section of the shop is devoted to the manufacture of the "Witton-Kramer" specialties, which include the well-known lifting magnets, made up to 52 inches in diameter, to lift one ton of ore, two tons of pig-iron, or as much as 20 tons of steel, portable drills, and other tools, and a considerable range of travelling hoists and complete telfer equipments. The machine tool bay is equipped with some very fine machines, including very large planers, boring mills, and other special tools driven by individual motors. The large main shop is as full as it can hold with work, and it is not surprising to hear that another large new shop of considerable size is about to be erected parallel to it in the space between it and the fan works.

The power-house, from which the whole of the power for



750 H.P. CONTINUOUS CURRENT ROLLING MILL MOTOR.

driving the group of works is obtained, is situated in a separate building. The most interesting item is a large turbo-generator, which consists of the first D.C. high-speed generator built by the firm, driven by a Belliss turbine. There are also several other reciprocating sets, which bring the total capacity up to 5,000 h.p. Continuous-current motors are employed

throughout the works. Boiler extensions to provide power for the new shops about to be erected are already in hand. Behind the power-house is the dynamo-testing department, which is particularly well equipped for all kinds of tests of machines up to 2,000 kw., and at the time of our preliminary visit the other day some very interesting machinery was being tested, including some pipe-ventilated motors for a cement works, with special provision for preventing oil being sucked through the bearings by the difference of air pressure inside and outside the case. Several Kapp vibrators for the improvement of power factor were also undergoing tests. Adjoining the test house are the painting and packing departments, from which the machines are finally despatched. The company make all their own iron castings in a spacious foundry in a separate building, 335 ft. by 100 ft., at the back, capable of turning out over 60 tons per week.

### The Fan and Small Motor Works

Established in 1912 this forms practically a separate works, and consists of six single story bays, each 300 ft. by 30 ft. It is quite the largest works devoted to this class of work in the country. The first bay contains a magnificent row of presses and notching machines, upon which the whole of the core plate stamping for the main works is done, as well as that for the actual fan motors. Conveniently adjacent in the next bay is the die, jig, and tool-making department, and this, again, serves the whole establishment. The machinery department is at one end of the third bay, with an equipment specially adapted for the production of interchangeable work. Assembling of parts, such as motor frames, is carried out at the other end. Jig work is used wherever possible, and a very complete system of gauging is in operation. The armature and field coils are wound in the next bay, and in this and succeeding bays, one of which is illustrated, the assembling is continued, and complete fans and small motors are turned out. The arrangements for testing both individual armatures and coils, as well as complete fans and motors are extremely complete, and every fan turned out is most thoroughly tested. The last bay of all is largely de-



ASSEMBLING DEPARTMENT IN THE FAN WORKS.

voted to motors for miscellaneous purposes up to about 1½ h.p., including special motors for electric pulley blocks. Among the fans made there are many types, both for continuous and alternating currents, ranging from a diminutive table fan taking only 20 watts, to large ventilating fans for marine purposes. A specially interesting pattern is the Swan ceiling fan with its helical oil grooves, which automatically pump the oil up and prevent it running out of the bearings. In the winding of the armatures for these fans a most interesting machine is used which winds the coils in the slots themselves.

### The Switchgear and Arc Lamp Departments.

These departments are situated on the upper floor of the front and one side of the main engineering works. In the switchgear section a fine white marble board, 45 ft. long, for Cardiff is under construction as well as a good deal of switchgear, which the company has in hand for a contract for complete lighting plant for the town of Ermelo, South Africa. The standard G. E. C. ironclad, interlocked, oil-switch panels will also be examined with interest. A large section of these shops is devoted to the manufacture of motor starters and controllers, for which there is a special light machine shop. Enclosed switches, both for house service purposes and in larger sizes, are made in enormous quantities. Of one particular design of house-service switch in aluminium case as many as 15,000 are made in one year. Another very important part of the works is the adjoining arc lamp department, where in particular the opportunity can be taken to examine the details of the latest patterns of the famous Angold magazine lamp, and the special patterns of globes which have been designed for use with it.



### The Central Stores.

No description of the Witton Works would be complete without a mention of the central stores for finished goods, which are housed in a comparatively new building with three floors each 350 ft. by 50 ft. Here is kept a stock of practically all the company's manufactures except Osram lamps, including the products of the Illeene works, referred to later, as well as articles made at Witton. A vast stock is carried of something like 20,000 different articles, and the concentration of these at one point in a town so centrally situated as Birmingham greatly facilitates both efficient service to the various branch establishments and regulation of the rate of manufacture.

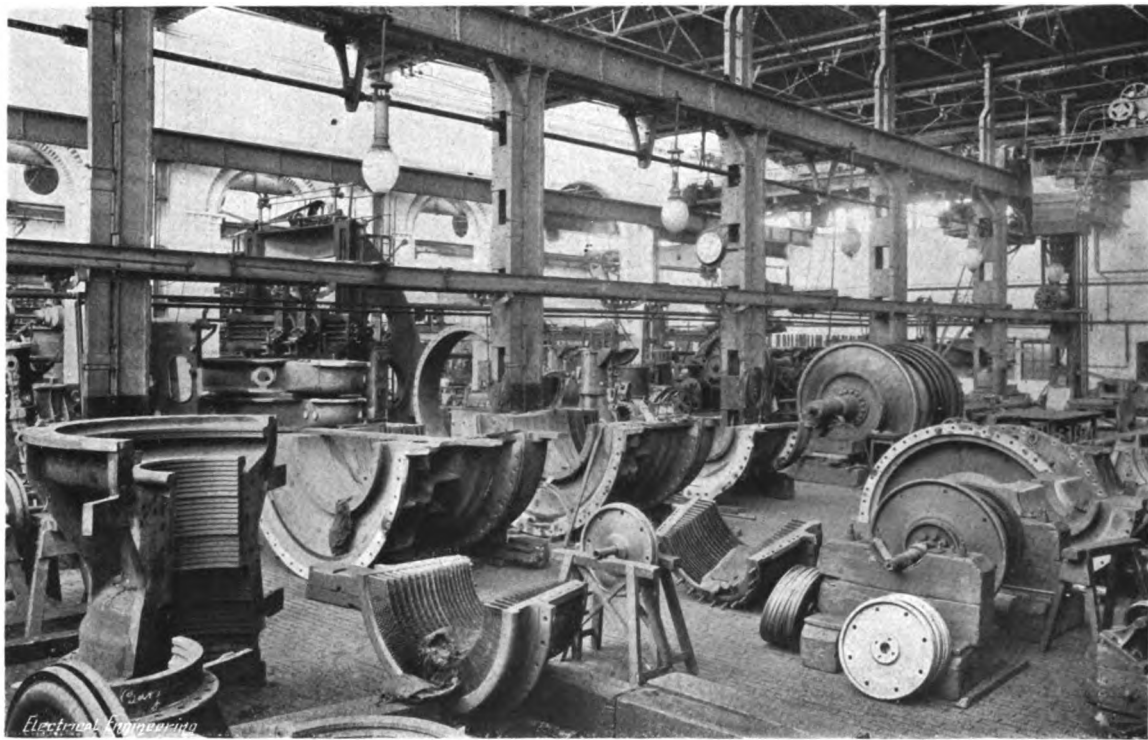
### The Conduit Works.

Beyond the central stores, and not far distant, is the Conduit Works, consisting of three bays, each 200 ft. by 110 ft., and with a capacity of 2,000,000 ft. of conduit per week. There is much of interest in the methods employed. Several kinds of conduit tube are made. What is known as "close joint" conduit is made by bending up flat strips in special machines by a series of rolls. This is done both hot and cold. In the hot process the strips are fed through a muffle fired by crude oil, and the edges turned up and bent over in two operations. The machines used can make any size of tube in this way up to 2-in. diameter. In the cold process used for lighter gauges of material the rolling is performed in four operations. Another class of tube has the joint welded. Here, again, two processes are in use.

### WILLANS & ROBINSON'S VICTORIA WORKS, RUGBY

THESE works will be open to members who desire to see them on Wednesday afternoon, when the Company will convey their guests to Rugby and back from Coventry.

The works were started up in 1897, and have been extended from time to time to cope with an increased volume of work. From 1,000 to 1,100 men are now employed. The leading manufactures consist of steam turbines, Diesel oil engines, condensing plants, and high lift turbo pumps for collieries, waterworks, &c. The foundry is one of the largest in the Midlands, and a quantity of castings are produced there for outside engineering works, as well as all the firm's own castings, which are made from a very high grade of cast iron. The illustration shows a corner of the turbine blading shop. Amongst the turbines to be seen in the foreground are parts of three units of 3,000 kw. each on order for the West Australian Government's Station at Perth, built to the order of Messrs. Merz & McLellan. A large rotor in the background is for a 7,500-kw. turbine for Leeds Corporation. A similar set, but of 8,500-10,000 kw. output, is being built for Sheffield Corporation. Amongst other turbines of interest, and now in the course of construction, attention may also be drawn to a 3,000-kw. machine to run at 3,600 r.p.m. ordered for Regina, in Canada. This is a fair illustration of the modern upward tendency in the speed



PART OF BLADING SHOP AT WILLANS & ROBINSON'S WORKS.

In one the tube is first formed out of strip in the same way as with close-joint tube, and the joint is then closed by passing slowly in a special machine through an acetylene blow-flame. There are several of these welding machines fed by a group of six acetylene generators. In the other or fire welding process the strips are placed in a furnace and drawn out through dies by a chain-draw bench, the last operation closing the joint with a continuous weld. The process is a fascinating one to watch, and requires no little skill on the part of the men at work. A certain amount of brazed tube is also made. An extremely ingenious machine is in use for lining tubes with insulating material, which is stuck on to the inner walls of the tube by a method employing compressed air. Another interesting part is the enamelling department, where tubes are dipped in troughs of black liquid enamel, hung up in frames to drain, and then transferred in batches by overhead runways to the steam-heated drying ovens. A large quantity of conduit fittings are made for which there are extensive punching and machine shops, containing many interesting special machines for making bends, which are bent from short lengths of tube with stout helical springs inside them, and for producing both stamped and cast fittings. All these are also enamelled in special stoves. Watertight cast-iron electric-light fittings are also made in this department. There are, of course, commodious stores, and the whole works strikes one as very conveniently arranged for the progress of the work through it.

output curve; 60 cycles being the standard frequency in Canada, the company have had to get out a special series of patterns for 3,600 r.p.m. turbines to enable us to meet this market's requirements. There will also be a good deal of interest to be seen in the manufactured stores' bay. All parts of machinery are passed into this bay to be checked to gauge, and, wherever the process permits, parts are held in stock to be drawn on as orders demand. The tool room, in which all jigs, gauges, and tools are made and stored, is also particularly worthy of note. The works have always been equipped with a very complete set of gauges. In the fitters' bay end of the erecting shop will be seen a large number of Diesel engine parts, and some steam turbine-driven centrifugal pumps used in connection with condensing plants and also supplied for marine work, and at the other end of the erecting shop a series of complete surface condensers, and parts of ejectors for the Willans-Müller rotary air pump system. Particular interest will centre round the works' Diesel engine. This is a three-cylinder enclosed engine driving a 330-kw. Peebles continuous-current generator, and supplies power for lighting and driving the shops. This engine runs at 187 r.p.m. Since its installation the company have been able to reduce materially their generating costs. These now stand at 0.6 per unit for oil at 80s. per ton, and with full maintenance and depreciation allowance. The cost of fuel is much lower this year, so that they anticipate being able to show a further reduction.

## THE ILEENE WORKS OF THE GENERAL ELECTRIC CO.

**A**LTHOUGH it is possible that time may prevent all the visitors who go over the Witton works from going over the General Electric Co.'s fittings works, no description of the works of the Company in the Birmingham district would be complete without a reference to their Ileene Works in Wheeley's Lane, Edgbaston, Birmingham.

At these works, which are compactly arranged in a building of several floors, adapted from an old brewery, and have been in operation for about three years, over 550 hands are employed in the manufacture of electric light fittings of all sorts, switches, lampholders, and other accessories, as well as electric heating apparatus. These operations were formerly carried out on a smaller scale at the old art metal works in Sherlock Street. The main building, which owing to its clever arrangement is at the same time roomy and compact, consists of a basement, ground floor, and four upper floors, each 8,000 sq. ft. in area, besides stores, offices, and other departments in separate buildings.

In the basement under part of the building there are extensive rough material and other stores, and on the ground floor is the brass and bronze foundry, where ornamental castings for fittings of a very high order are produced. Some of them necessitate the most elaborate patterns, and in the pattern stores are preserved some really fine examples of the wood-carver's art, as well as enormous numbers of the metal patterns from which the castings are usually made. A very complete system of numbering and cataloguing the patterns is in use, and special fittings can very readily be made up by utilising existing patterns. On the same level are also the dipping and plating sheds, and in adjoining sheds are annealing stoves, a grinding shop, and the main boiler.

A very interesting part of the ground floor of the main building is the group of special multiple simultaneous automatic stamping machines for such work as switch covers or lamp-holder bodies, in which successive operations are carried on by a series of stamps side by side, and the work automatically passed on from one to another. On the first floor are shops for the making up of fittings, and the new pattern of "Magnet" electric fire described in *ELECTRICAL ENGINEERING*, May 14th, page 292. On the same floor are the spinning shop, reserve benches for switches and lamp-holders, the pattern-making and chasing shops, the polishing department, and a shop devoted to the manufacture of kettles, toasters, and such articles. The fitting of the heating element to these fires, toasters, kettles, &c., is carried out on the next floor above, where there is also a busy test room, where every piece of heating apparatus is tested before despatch. There is also a small repair shop, and rooms for hot lacquering, cold lacquering, French lacquering, and other finishing processes, besides fitters' shops for the assembly of fittings, fires, &c. It may be noticed that the hot lacquering stoves are all electrically heated. The third floor is devoted mainly to machine shops for fittings, parts, &c., with a tool-makers' shop attached. Owing to the great variety of work, capstan lathes are found preferable to fully automatic machines. The assembling of tumbler switches, &c., is also carried out on this floor, and it may be noted that electrically heated wax pots are used for filling in the holes in the bases. The fourth floor is devoted mainly to the packing and despatching department, so that it will be seen that in general the progress of the work is upward, from the rough material stores in the basement to the packing of the completed articles at the top. There are extensive box stores in the roof. It is difficult to realise when walking through the works how large an amount of work is turned out until it is pointed out that the large heaps of parts or complete goods waiting for removal in each shop represent only a fraction of a day's work, and when taken away will quickly be replaced.

## THE WORKS OF BELLISS AND MORCOM, LTD.

**O**NE of Tuesday's visits will be to the Birmingham works of Belliss and Morcom, Ltd., whose name is so well-known to electrical engineers as manufacturers of the famous Belliss high-speed engine. These are still manufactured in large numbers for the driving of electrical plant, and the firm have also for some time constructed steam turbines, and have more recently turned their attention to Diesel engines and small paraffin engines. Another extensive branch of their activity is the manufacture of air-compressing plant.

Having originated his general engineering business in Ledsam Street, Birmingham, in 1852, the late Mr. G. E. Belliss turned his attention from 1884 onwards, in conjunction with the late

Mr. Alfred Morcom, to marine engines for the propulsion of such fast craft as torpedo boats, launches, &c.; but seeing the great opportunities for applying the experience in high-speed engine construction thus acquired, to the manufacture of special engines for driving electrical plant, they came to specialise more and more in this direction till about 1892, when the marine work was practically discontinued, except as regards engines for auxiliary purposes and the air compressors for torpedo and other work. The rate at which the works has expanded is best shown by mentioning that in 1883 no more than 100 men were employed, while at present the pay roll comprises some 2,000 names.

The older works at Ledsam Street have been entirely remodelled, and are now employed for the manufacture of high-speed steam engines for ship lighting, auxiliary purposes, &c., up to about 90 h.p., the smaller air compressors, and paraffin engines for house lighting, &c., up to 35 h.p. This part of the works has very complete testing arrangements, fully equipped for the steam and electrical side of tests of combined sets. All the machinery is driven electrically, and in the power-house visitors will examine with interest the historic "No. 1" Belliss engine, which has been running regularly since 1889. There are also two 100-kw. sets driven by engines of later make, and, as completing the history, a fine 200-h.p. 4-crank Diesel engine of the vertical 4-cycle pattern running at 250 r.p.m. It has always been the firm's practice to gain experience in their own works with the first engine of a new kind before supplying them in large quantities, but their Diesel engines are now beyond the experimental stage, and a group of five are now under construction for Southend Electricity Works.

All the larger work is done at the newer works a short distance away in Icknield Square, which is a fine example of a spacious, orderly, and well-equipped electrically driven works. Just as the power-house in the older works contains the first high-speed reciprocating Belliss engine for electrical works, and the first Belliss-Diesel engine, so we find in the power-house of the new works the first Belliss live-steam turbine and the first exhaust steam set of 200 kw., as well as two 400-kw. reciprocating sets. The works is driven throughout by 220-volt continuous-current motors, and considerable use is made of compressed-air tools which are supplied by electrically driven compressors at various points. The testing equipment is on a very large scale. A special battery of Babcock & Wilcox boilers, with a separately-fired superheater, is provided, from which steam at any pressure superheat can be obtained. Permanent condensing plant is also provided to which engines and turbines under test can be connected, and provision is made for absorbing the load of electrical generating sets in tank resistances. Engines which are not for driving electrical plant are tested on balanced water brakes of special design. An interesting item in the equipment is a special turbine for balancing turbine rotors under construction.

It is not perhaps generally known that the firm has been experimenting in steam turbine work for some 10 years, and the Belliss turbine reached a high degree of perfection before being placed on the market. They are entirely impulse machines, although both "disc" and "drum" forms are employed. One or two different methods of fixing the blading are employed, according to the proportions of the particular machine. These are simple and ingenious, and give extremely rigid rows of accurately spaced blading. The result of the firm's experience has been that below 1,500 kw. so many advantages are possessed by their reciprocating engines, that the adoption of a turbine is only in exceptional cases good practice. In the case of exhaust steam turbines, however, the limiting size is much lower, and they have standards down to about 200 kw. Before placing a turbine in the market they built several experimental turbines, one of which, of the exhaust steam type, was coupled to the exhaust mains of their shop engines, and has been working daily since the end of 1907. Although only of 200 kw. capacity, the saving on their power-house costs amounts to 1,000 tons of coal per annum, owing to the utilisation of a 28½-in. vacuum. A particular feature of the Belliss turbine is the way in which the whole of the governor gear, which is on the oil-relay principle, is enclosed, and the simplicity of the forced lubrication arrangements, which practically follow the lines of those of the reciprocating engines.

The foundry with its three cupolas can turn out 100 tons of castings per week, and can handle single castings up to 25 tons. Forgings up to 5 cwt. are worked in the smithy, and a large annealing pit and oil-hardening tank is provided. The main machine shop is 280 ft. long, with one 50 ft. and two 25 ft. bays. The equipment of machine tools is very complete, and includes some very large boring mills and planers, with the latest methods of independent electrical drive, and many ingenious small tools for special operations. The main erecting shop is 300 ft. by 50 ft.

One cannot help being very much struck in going through the works by the great care exercised in testing the materials employed for the steel forgings and iron castings used. Tensile, elongation, and impact tests are taken of the steel, and tensile hardness, bending, and shrinkage with every cast. The microscope is also largely used. The cupola practice is scientifically up-to-date, a chemical analysis being taken of all iron and coke

used, as well as a complete series of physical tests of samples taken from the castings and pig iron. Great precautions are also taken to ensure accuracy in the machine shop. The tool room is equipped with a very complete range of jigs and gauges of every description, and the greatest care is exercised in the issue of same to the various departments, each gauge being checked before delivery, on a Whitworth measuring machine, recording up to 8 feet. Micrometer calipers are extensively used in the works, ranging up to 15 in. It is this kind of care and thoroughness that has led to the high reputation that is enjoyed by the firm, and rendered its products so deservedly famous.

### THE DAIMLER WORKS

THE works of the Daimler Motor Co., Ltd., which will also be visited on the Wednesday afternoon, have, apart from the interest of their products, many features which will appeal to electrical engineers as being a large up-to-date factory. The works are divided into two portions; one, electrically-driven, the older works, or Daimler works proper, adjoining the Corporation Electricity Works; and the other, the Radford works, on a large site a few minutes' walk away. The two sites aggregate about 30 acres, and perhaps a better idea of the extent of the works is derived from the fact that over 5,000 men are employed, about equally divided between the two establishments.

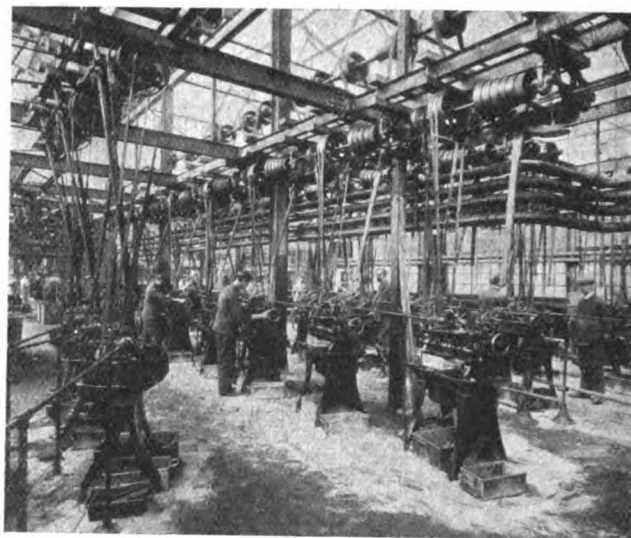
Electric driving is, of course, adopted throughout, and the company have their own power plant at the older works, but also purchase electric power from the Coventry Corporation. The generating plant consists of one 350 kw. and two 210 kw. sets, consisting of Cereis-Diesel engines driving Dick, Kerr alternators running at 188 and 150 r.p.m. respectively, and generating at 2,000 volts 50 cycles two-phase. This is the same pressure and frequency as the supply received from the Corporation, which thus serves as a standby as well as a supplementary supply. Either supply can be switched on to any of the circuits by means of the handsome 18-panel Westinghouse switchboard in the engine-room. It may be mentioned here that about  $4\frac{1}{2}$  million units are used per annum, of which about  $2\frac{1}{2}$  million are purchased and the remainder generated by the Diesel sets. Fuel oil is pumped into tanks accommodating a two months' supply from barges on the adjoining canal. Although canal water is used for engine cooling, a Heenan and Froude cooler is employed. An interesting feature is the provision of a spare electrically-driven compressor, which can be used in conjunction with any engine while its own is under repair. Distribution throughout the works is at 2,000 volts by underground cables, and at suitable distributing centres in the shops, transformers are provided stepping down to 200 volts. The transformers are controlled by Berry Skinner enclosed switch fuses, and, together with their low-tension distribution boards, are mounted in wire network cages. The low-tension distribution about the shops is mainly overhead. The distributing centres vary in size, but are mostly for 100 k.v.a. Two-phase induction motors, some of B.T.H. and some of Westinghouse manufacture, are employed. With the exception of about 50 of the larger machine tools group driving with short lengths of shafting is adopted.

The whole of the machine shops, and they are very extensive, are in the older works, and here all engine, gear-box and other chassis parts are machined and the engines assembled and tested; finished engines and other parts are then sent over on motor lorries to the Radford Works, where the chassis of all sizes are assembled. At the Radford Works, where naturally there is not so much machinery, all the power is taken from the Corporation mains. The main part of the works is in the form of a huge single shop, a quarter of a mile long, with three 40 ft. and two 20 ft. bays. Erection of all kinds of chassis, including those for private and commercial vehicles and omnibuses, is done here, and enormous batches may be seen going through. Coach-building is also carried on, on a very large scale. An interesting detail is the method of electrically heating rivets in the car frames in place. A cold rivet is simply placed in the hole, and two terminal blocks, connected by heavy leads to a step-down transformer of very simple construction suspended overhead, are held against its ends. In a few seconds the rivet is hot, when the leads are removed and the rivet closed by a hydraulic rivetter. Electric welding is also employed for coach ironwork, for which a British Insulated and Helsby welder is provided. A special siding runs alongside the main shop, and further on we come to the foundry, where both ordinary and malleable iron castings of very high quality are made. In the same department is a converter for the production of a special variety of high tensile steel for which the company is famous. A small amount of brass casting is also done. Some members will probably be interested in the system employed for heating these large shops. Instead of the now very usual method of distributing hot air in large trunks, there is a distribution of steam to special air heaters situated at convenient points in the roof of the shops, where the air is drawn in by motor-driven fans and heated locally.

### J. H. TUCKER & CO.'S WORKS

AMONG the Birmingham firms who (on any day of the Convention except the Saturday) are inviting members of the I.M.E.A. to visit their works is J. H. Tucker & Co., who have a very modern factory for making their well-known switches and switchgear generally, besides a large variety of electrical accessories. About 500 hands are employed, and the general layout of the works, the good lighting, and fresh air are almost ideal for a factory of this nature. The well-known Tucker switches are completely manufactured here; every part is made at the works except the porcelain bases—even the screws. In fact, more than half a million parts are made per week.

Most of the work is carried out in one large and airy shop, and one is struck by the ingenious automatic tools for some of the purposes. Some of the machines seem almost human in their action. One in particular was making from the solid rod the small pins for holding the handles of the switches. The thread is first cut in a die, the screw is then cut off, lifted against a saw to cut the slot in the end, and then dropped. Another



AUTOMATIC MACHINES IN THE MAIN SHOP.

ingeniously arranged machine cuts the thread for the switch covers after the handle of the switch is riveted on. A tool is applied automatically six times and cuts a comparatively deep thread.

The plating, lacquering, and finishing shops are specially worthy of note for their good ventilation, in particular the dipping shop (where the metal is cleaned before plating), in which the fumes are sucked off immediately above the vats so effectively that no smell at all is noticeable. The firm does all its own cabinet and teak block work, which is by no means trifling, as the manufacture of distribution boards for house wiring is one of its specialities. On galleries running round the main shop the assembling of the switches and other accessories is carried out, and the speed and accuracy of this work is as much a tribute to the good lighting and ventilation as to the nimbleness of the fingers of the girl workers. The works are almost in the open country, but easily accessible by train or tram. Members should take train from either Snow Hill or Moor Street stations, Birmingham, to Tyseley (the journey taking only 12 minutes), and Tucker's Works are then only a few minutes' walk. The firm's telephone number is 101 Acoc's Green, and they would appreciate being notified of intended visits.

**The British Thomson-Houston Co.'s Rugby Works.**—Arrangements are being made by the B.T.H. Co. (as well as by Willans & Robinson) for members to visit their works at Rugby on Wednesday, June 17th, when the Association will meet at Coventry. Those who signify their intention of taking part in this visit will leave Coventry Station at 2.37 p.m., and return in time to catch the 5.35 special train from Coventry to Birmingham. It is proposed on this occasion to include a visit to the incandescent lamp factory of the B.T.H. Co., which is usually closed to visitors. It will be necessary for those wishing to take part in the visit to make application beforehand, as we are informed that no one will be admitted without a ticket.

**Other Works Open to Inspection.**—In addition to the works mentioned above, arrangements are being made for the following works in Coventry to be open to inspection by small parties:—Coventry Ordnance, Triumph Motor-Cycle Works, Coventry Chain Co., and the Coventry Motor Works of the British Thomson-Houston Co. We understand also that Chamberlain & Hookham extend an invitation to delegates to visit their motor works in Birmingham during the Convention in small parties. Early application is necessary to enable arrangements to be made.

## THE WORCESTER ELECTRICITY UNDERTAKING

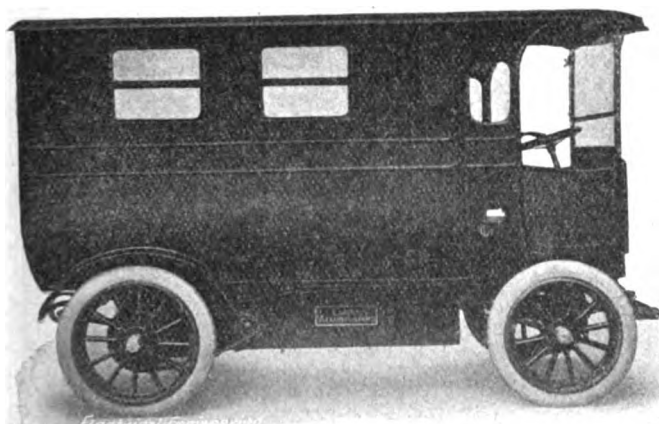
ON Saturday, June 20th, a visit is arranged to Worcester, where the Powick generating station will be inspected. The Worcester electricity undertaking is interesting as being one of the few in this country where water power is made use of.

The scheme was initiated in 1894, when the Powick station started work with four 125-kw. alternators, two of which were arranged to be driven either by water turbines or steam engines, one by water power only, and one by steam only. The original generators were Mordey Victoria alternators, driven by gearing and ropes from vertical shaft from Victor turbines running on a fall varying from 3 to 10 ft. Clutches permitted of either the turbine gearing or the steam engines being connected to the rope wheel. One set was driven by two small turbines for convenience in handling light loads. The system was single phase at 2,200 volts 100 cycles. A 300-kw. Ferranti steam alternator was added in 1898, but soon this plant became inadequate, and in 1902 a new steam-driven works was opened at Hylton Road in another part of the town, and this originally supplied continuous current only, but A.C. plant was afterwards added to form a connecting link to the old station. The original plant at Hylton Road aggregated 820 kw., and subsequent extensions, including a 1,500-kw. turbo-alternator, inaugurated at the beginning of this year, bring the total plant capacity of both stations up to 3,800 kw. In the meantime, however, all the steam plant had been removed from Powick, which is now a water-power station entirely, and in 1912 the system was changed from single-phase 100 cycles to three-phase 50 cycles, when some of the old alternators at Hylton Road were removed, and one of the old sets at Powick was replaced by a new 250-kw. water turbine with vertical shaft alternator, which will be the most interesting machine that will be inspected. Two motor-generators form the connecting link between the A.C. and D.C. systems, so that the water-power station can feed into the D.C. network when required.

## THE ELECTRIC VEHICLE DEMONSTRATION

CENTRAL station engineers and others who are watching with interest the rapid developments that are taking place in the use of battery-propelled vehicles, will be particularly attracted by the demonstration of electric vehicles which is to take place on Tuesday outside the works of the General Electric Co. at Witton, in which some six or seven firms will be participating.

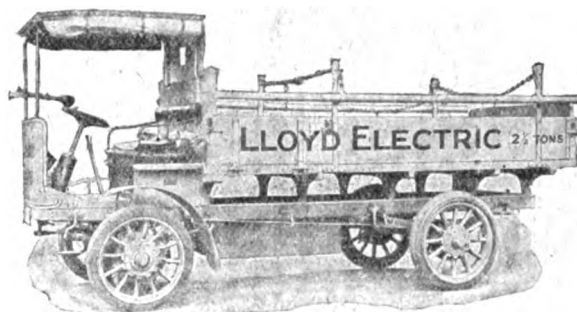
The Edison battery will be represented on the four cars that are to constitute the exhibit of Edison Accumulators, Ltd. (2 Duke Street, S.W.). These will comprise a half-ton and a two-ton van of a type now familiar in the London streets, the



EDISON ELECTRIC AMBULANCE.

electric ambulance illustrated here, and a small two-seated passenger car. The half-ton van is driven by chain gear through a differential jack shaft by a single series motor controlled by a five-stop controller, has a battery of 60 "A4" cells, and is designed for a maximum speed of 14 m.p.h. and a mileage of 45 to 55 on one charge. The two-ton chassis is somewhat differently arranged; the transmission is by propeller shaft from the single motor to the differential bevel shaft, which drives by side chains. The battery, weighing 9,800 lbs., has a capacity of 300 ampere hours at 65 volts, and is contained in an easily removable cradle. The chassis weight is 5,400 lbs., and a mileage of 45 to 50 miles at 9 to 11 miles per hour is obtainable. The ambulance is designed for 14 miles per hour and a 50 to 60 mile range, and carries a 60 cell 150 ampere-hour battery.

The two-seater with a radius of 60 to 80 miles, runs at speeds up to 21 m.p.h. Another interesting group of vehicles will be the 2½-ton lorry and 5-cwt. delivery van on the Lloyd system exhibited by Mossay & Co., Ltd. (45 Horseferry Road, S.W.). A vehicle similar to the larger-sized one that will be exhibited is illustrated here. Full particulars of these cars were given in a special illustrated article in *ELECTRICAL ENGINEERING*, March 12th, 1914. It will be remembered that the principal feature of the system employed is the use of separate motors, one to drive



2½-TON LLOYD ELECTRIC LORRY.

each of the front wheels through single reduction gearing, arranged so that the whole unit of wheel, motor, and gear turns on the steering pivots. Tudor batteries are employed, and a controller giving a particularly large number of steps, and providing also for regenerative braking, is used. The battery in the 2½-ton chassis is mounted under the centre of the vehicle, and is lifted and lowered by a special hoisting gear on the chassis, but the weight is taken normally by hooks. In the smaller vehicles, the hoisting gear takes the form of jacks on the battery trolley. The 2½-ton chassis has an available platform length of 11 ft. 5 in., and weighs without battery 1 ton 5 cwt. The battery of forty cells, of a capacity of 280 ampere-hours, weighs 17 cwt., and is designed to propel the vehicle forty miles on one charge, with a consumption of 1.25 miles per kw.-hour charge.

A somewhat different method of drive is adopted in the two three-wheeled cars to be shown by the Torpedo Electric Motor Co. (122 Hampstead Road, N.W.), although in this case also the front wheel serves both for driving and steering. These two vehicles will be a half-ton covered van and a four-seated passenger car. The company are also producing a four-wheeled 15-cwt. van, but an example will probably not be ready in time to be shown. The six-pole motor is built into the front wheel, and is arranged so that the field case on which the wheel is



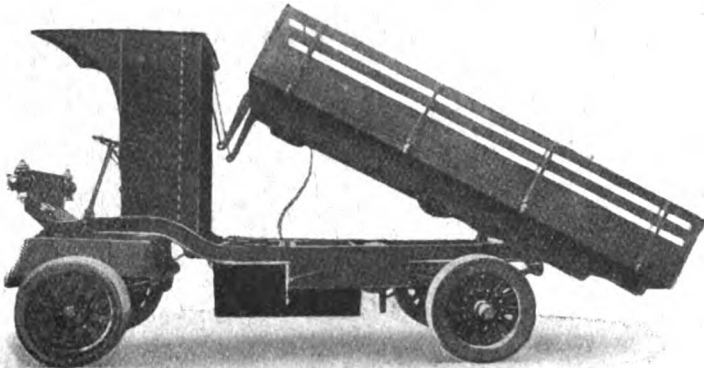
10-CWT. "TORPEDO" THREE-WHEELED LORRY.

mounted and the armature revolve in opposite directions, being coupled together by an epicyclic gear, which has the effect of giving a five to one gear ratio. Speeds up to 15 or 20 m.p.h. can be attained, and the 150 ampere-hour battery gives a radius of action of about 50 miles. The illustration shows the way the whole wheel motor and springs suspensions turn for steering, and the arrangement is such that a particularly good steering lock is obtained. A considerable number of these handy little cars are in use, and they have been found very suitable for the dairy trade. The control is by a pedal and is very conveniently arranged.

Front drive is also employed in a rather different form in the F.R.A.M. vehicles, of which Mr. Conway Jenkins (175 Piccadilly, W.) proposes to show an example. In this system, which is particularly intended for heavy vehicles. The whole of the driving equipment, including motors, control gear, and part of the battery, is contained in a fore carriage pivoted to turn bodily for steering. One motor drives each front wheel through internal spur gearing, and a series parallel control is adopted with provision for electric braking. One of the most interesting features is the way in which the steering gear is interlocked



with the controller, so that a number of cells connected to the motors is made unequal, so that the outer one revolves faster than the inner one when on a curve, giving a differential action and greatly assisting the steering. A tip van on this system is illustrated here, but obviously it is easy to use more than one style of vehicle with alternatively the same fore-carriage. These

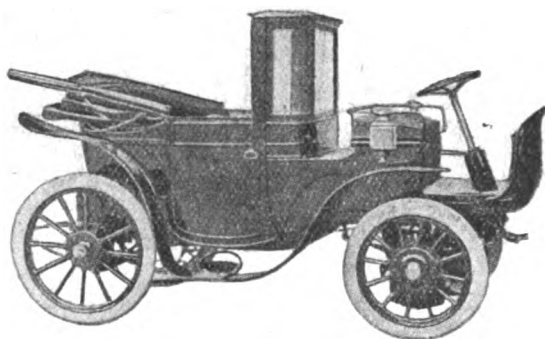


F.R.A.M. TIP VAN.

vehicles, which can carry loads up to 5 tons, are largely used for municipal purposes in Paris.

Vehicles are also to be shown by the General Vehicle Co., of New York, who are represented in this country by Mr. E. W. Curtis, of Queen Anne's Mansions, S.W. These will include a half-ton "G. V." parcel van capable of a 50-mile range and a maximum speed of 15 miles per hour, driven by a single series motor through worm gear, and a 2-ton van with canvas-covered body, driven by one motor through double reduction chain gearing. This has a radius of action of 45 miles, and can run at speeds up to 12 miles per hour. Among points of interest on these vehicles are the enclosure of all the wiring in metal conduit and of the control gear in a sheet metal fireproof box. The large van is equipped with an ironclad "Exide" battery. In addition to the above vehicles, it is hoped that a new vehicle will also be sent to the demonstration by W. A. Stevens, Ltd. (26 Victoria Street, S.W.).

An electric carriage which is being driven up to Birmingham to take part in the demonstration by the Krieger Electric Carriage Syndicate, Ltd., 48a Gillingham Street, London, S.W., is illustrated below. Power is obtained from a battery of 50 Naylor cells, which are divided into two batches of 25, and situated at each end of the car. The drive is by two  $3\frac{1}{2}$  h.p. motors, which are coupled to the front wheels through phosphor bronze and steel helical gearing. The control is effected at the steering-wheel, and six running speeds are obtainable. The first four speeds are obtained by running both motors in series



KRIEGER ELECTRIC LANDAULETTE.

with either compound or series field-windings, and utilising either half or full voltage of the battery. The two higher speeds are got by connecting the motors in parallel, and having either series or compound wound fields. Regenerative braking is employed for the front wheels, and the ordinary mechanical band brake for the back wheels. A foot control is provided by which the motors may be cut out of circuit immediately, and cut in again through a rheostat. Electric lighting is used, the lamps being 45 volt with carbon filaments. The normal rating of the battery is 35 amp. hours, although in a case of emergency this may be considerably exceeded. It is intended to make two stops of one hour each for charging at Bedford and Rugby.

**The "Point Fives."**—As already announced in our columns, the special meeting of the "Point Fives" will be held on the evening, Thursday, June 18th, at the Grand Hotel, Birmingham. The time of the meeting is 10 o'clock, and Mr. Allen, of Wolverhampton, will be in the chair. Supper will be served at 3s. 6d. per head. No tickets are required, as the meeting is open to as many as the room will hold. Evening dress is optional.

## TELEVISION

**A DEMONSTRATION** was given recently before the members of the Institution of Automobile Engineers of an apparatus for the electrical transmission of images of moving objects. The property, peculiar to selenium, of altering its electrical resistance on exposure to light, has been utilised before for the more or less imperfect transmission of images of stationary objects. In this apparatus Dr. A. M. Low, the inventor, makes use of the same property. The image to be transmitted is thrown on to a number of selenium cells through a suitable lens. The resistance of each cell varies with the intensity of the light falling upon it. A roller provided with platinum contacts is driven by an alternating current motor backwards and forwards over these cells, making contact with each cell in succession. At the receiving end there is a similarly driven roller moving over a number of contacts, insulated from one another and arranged in the same fashion as the selenium cells. The motors at the receiving and transmitting stations are tuned to run in synchronism, so that the circuit is made between each selenium cell and the corresponding contact in the receiver in rapid succession. The current through each contact will thus be dependant upon the intensity of the light on the corresponding selenium cell. These currents are utilised to control magnetically, the adjustment of a number of steel slats which admit light to squares in the same relative positions as the corresponding cells in the transmitter.

The selenium cells are insulated by thin sheets of mica, and the roller and the cells over which it moves are immersed in paraffin. An induction coil is employed for supplying the transmitting current at a pressure of about 50,000 volts, as this has been found necessary on account of the thin film of paraffin which prevents complete contact between the roller and selenium cells. The total power required is about 80 watts for the sending, and about 50 watts for the receiving apparatus.

In the present stage, however, the pictures obtained are quite crude, as might be expected from the comparatively large squares of which they are composed. The cost of manufacturing the apparatus is considerable, and Dr. Low does not desire to commercialise it until further progress has been made.

## OZONAIR BLEACHING PROCESS

**A NOVEL** application of electricity was seen during a visit organised by Ozonair, Ltd. (96 Victoria Street, London, S.W.), to a wax bleaching plant at Brentford. The plant consists essentially of an electrically-driven blower, an air-cooler, a battery of five ozonisers, and the vessel in which the material is treated. Air is drawn in by the blower, and is discharged through the cooling apparatus, which consists of a water-cooled tank and a CO<sub>2</sub> refrigerator. The cold air now enters the bank of ozonisers through a distributing pipe. These ozonisers have electrodes consisting of flat sheets of wire gauze made of a special alloy, and separated by a dielectric of micanite. High-tension current is supplied from transformers, which have a primary p.d. of 220 volts and a secondary p.d. of from 7,000 to 9,000 volts. A five-point regulator in the primary circuit enables the secondary voltage to be varied as required. The discharge which passes between the electrodes effects the production of considerable quantities of ozone in the air, which is now led to the bottom of the treating vessel, and passes up through the molten wax in fine jets. The ozone present effects the bleaching of the wax. The capacity of the plant inspected was 1 ton of beeswax a day of ten hours, at a total energy consumption of 100 kw. hours.

The installation of this plant has shown very clearly the advantage of using electrical methods for bleaching, in place of the older chemical processes. Whereas the cost of chemicals required for the bleaching of one ton of beeswax in the ordinary way would be about 75s., the cost of electrical energy required to do the same work averages about 5s., so that even after allowing an amount for interest and depreciation of the electrical plant, there is a considerable balance in its favour. Apart from this, the wax bleached electrically is purer and harder than that which has been treated chemically.

**Electrical Child Culture.**—Speaking at a conference of the Child Study Association at Edinburgh, last week, Sir James Crichton-Browne referred to the experiments which had shown that certain forms of electrical stimulus could accelerate the growth of not only plants, but also animals. He sounded a warning against the application of such methods of intensive culture to children, and said that a heavy price might afterwards have to be paid for any immediate spurt of growth thus obtained.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,395.

A three-phase slip ring motor controlled by a reversing type controller, drives a tramcar, and in coming down a steep incline the car runs away and the brakes refuse to act. Can the motor when driven up to or above synchronous speed by the momentum of the runaway car be utilised as an induction generator feeding back to the line, and act as a brake on the car? In what position should the controller be put, i.e., to run the motor in the same direction of rotation or to reverse it, and to get the maximum brake effect as an induction generator should all resistance be cut out of rotor circuit? What is the relation of brake effect and speed of motor under such conditions? What would be the effect of attempting to reverse the motor while the car was running away.—"PUZZLED."

(Replies must be received not later than first post, Thursday, June 18th.)

### ANSWERS TO No. 1,393.

In house-wiring installations consisting only of plain pendants, compare the relative advantages and disadvantages of: (1) looping-in in the ordinary way both at the ceiling roses and switches, or (2) using 3-plate ceiling roses and looping-in only at the ceiling roses.

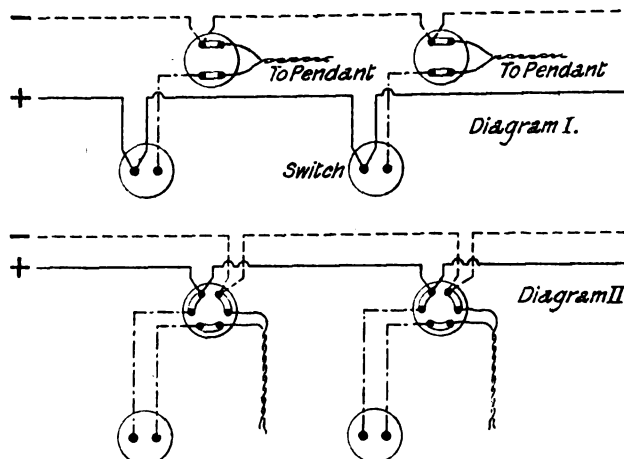
The first award (10s.) is given to "LUPIN" for the following reply:—

In house-wiring installations consisting of single pendants only, I think the use of three-plate ceiling roses unnecessary. With three-plate ceiling roses it is claimed that, owing to the wires to the switches being less, and therefore the size of conduit smaller, a saving is realised. But comparing the two systems, the saving would be little, if any. For house jobs it is advisable to use the same size of conduit for circuits, instead of having different size tube and fittings (reducing). With three-plate roses, even when the switch is off, the full line voltage is at the terminals, which is not what is wanted when new flexible has to be fitted. Also the number of wires at one point, if it is required to loop in different directions, might lead to complications. If it is wanted to go to a "point," and feed back again, it means at least two more wires in the conduit leading to that "point." For this case I think looping in at switches and ordinary ceiling roses is all that is required; it is simpler, and uses the same size of conduit throughout.

The second award (5s.) is made to "J. H. B.," who writes:—

The ordinary method of wiring separately-controlled pendants is shown in Diagram I. Here a double length of main cable has to be used to loop in at the switch, the mains being tapped off the fuse-board. This necessitates conduit or casing equal in cross section to that enclosing the mains, for the switch leads, and also a great cost of cable. With the three-plate ceiling rose system, as shown in Diagram II., instead of looping down the positive main to each switch, and thus using two lengths of full-current carrying capacity

cable, with its corresponding full-sized casing or conduit, the positive and negative mains are taken straight from the fuse-board along the whole length of circuit, leaving wire



to loop into the ceiling rose. The wires going to the switch are just of sufficient capacity to carry the current for the lamps on a single pendant.

By using the ceiling rose with three plates the length of wire used for switch leads is reduced by one-third, also the current carrying capacity of this wire is greatly reduced, the amount depending upon the number of pendants to be put on one circuit. Thus we get a considerable reduction in the area of conduit covering the switch leads, and when a large number of switches are to be used on an installation the cost of wiring is greatly reduced. Of course, the three-plate ceiling roses are more expensive, but this increase is small compared with the saving in wire.

**Electricity Supply in London.**—The Committee of the London electricity supply co.'s engineers which was called together at the time to report on the County of London company's Bill and scheme for remodelling the supply arrangements in London, is now drafting out a scheme of its own, which will, we understand, be shortly considered by the Boards of the various London companies. This will be in a way a reply to Messrs. Merz & McLellan's report to the London County Council, and will have an important bearing on the present situation.

**The San Francisco Electrical Congress.**—Some further information is to hand regarding the Electric Congress which is to be held in connection with the Panama-Pacific Exhibition, 1915. A large number of papers have been promised, and the proceedings are expected to fill 13 volumes dealing with the following subjects: (1) Generation, transmission and distribution; (2) Apparatus design; (3) Electric traction and transportation; (4) Electric power for industrial and domestic use; (5) Lighting and illumination; (6) Protective devices, transients; (7) Electrochemistry and electrometallurgy; (8) Telegraphy and telephony; (9) Electrical instruments and electrical measurements; (10) Central-station economics; (11) Electrophysics; (12) Miscellaneous; (13) General Congress proceedings. The five-dollar membership fee includes the general index and any four volumes. The Congress will be of similar nature to those held at St. Louis in 1904, at Marseilles in 1908, and at Turin in 1911, and a record attendance is expected. The Electrical Congress must not be confused with the other meetings which are to be held about the same time. The respective dates of those of interest to electrical engineers are as follows:—The International Electro-technical Commission meets during the week beginning September 6th, 1915; the International Electrical Congress during the week beginning September 13th; and the International Engineering Congress in the week beginning September 20th.

**Electricity and Aviation.**—According to the *Standard*, the War Office and Admiralty are about to undertake a series of experiments in the direction of the electric driving of aeroplanes. It is stated that a new form of electric battery has come to their notice.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published June 4th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in *italics* indicate communicators of inventions from abroad.

11,370/13. **Manufacture of Steel.** B. T.-H. Co. (*G. E. Co., U.S.A.*). This specification deals with the manufacture of silicon steel having a very low hysteresis action. Silicon steel sheets are assembled in packs and placed between graphite heaters in an electric furnace. The latter is then connected to an evacuator, and the internal pressure reduced to a pressure equal to 2 mm. of mercury, and the temperature is raised to about 1,325° C. All the oxides present in the silicon steel are thus reduced. The duration of the heating process depends upon the amount of steel to be treated, whereas a charge of 500 lbs. requires a run of five hours, 100 lbs. can be treated in about two hours. The resulting product has a peculiarly large granular structure, and low hysteresis factor. Four figures.

11,371/13. **Wireless Transmitters.** G. MARCONI. A wireless transmission system by which continuous streams of oscillations may be produced. Two or more condensers are charged through suitable inductances from a common battery, and are discharged alternately through the primary windings of an induction coil. The secondary terminals of the coil are connected either to the aerial circuit or to a circuit which is in tune with, and coupled to, the aerial circuit. Each condenser discharge circuit must have the same time period as the aerial and intermediate circuit. The period between the commencement of discharge from one condenser and the commencement of discharge from the next condenser should be an exact multiple of the natural time period of the aerial and of the closed discharge circuit. This is effected by the use of disc dischargers which can be rotated at the necessary speed, and an auxiliary or trigger sparking device by means of which small sparks are produced in the discharge gap of the condenser circuits, so as to start the main discharge at the proper moments. Two figures.

12,919/13. **Arc Lamps.** A. H. RAILING and E. A. ANGOLD. A combined spark gap and automatic cut-out for series arc lamp circuits. The spark gap is made smaller than any gap across the insulation in the lamp, and is arranged in series with a resistance. The shunt coil of the cut-out is connected across the lamp terminals. When an abnormal voltage comes on the lamp, the current rushes across the gap, but as it also has to pass through a resistance, the shunt coil is not short-circuited. Hence the cut-out armature is attracted and the lamp is short-circuited and the spark quenched. One figure.

13,135/13. **Braking of Motors.** J. KLINKENBERG. The motor is caused to act as a generator during the braking period. Instead of utilising residual magnetism of the field for this purpose, a relay is provided which, when the motor is acting regeneratively, closes the circuit which excites the field coils of the motor. When the motor is brought to rest, the circuit is automatically opened. A braking resistance is inserted into the circuit to prevent excessive current, by a switch which is automatically closed when the external supply current is cut off. Three figures.

26,708/13. **Watertight Apparatus.** A. E. GRAHAM. This invention is intended to be applied principally to telephonic instruments which are kept in water-tight cases. A circular hole is cut in the case, and a gauze container holding a desiccating agent such as calcium monoxide, is inserted. The container is held in position by being attached at the outer end to a plug which is threaded externally, and can be screwed into place. When necessary, the gauze can be removed for refilling, by unscrewing the plug, and without disturbing the apparatus. Three figures.

## Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** AYRTON [Carbons] 22,319/13.

**Distributing Systems, Insulating Materials, &c.:** B.T.-H. Co. (*G. E. Co., U.S.A.*) [Regulation of distribution systems] 16,054/13; [Insulating material] 16,299/13.

**Dynamos, Motors and Transformers:** ZENK [Commutators] 11,886/13; R. BOSCH [Regulator for dynamo] 26,906/13; SIEMENS-SCHUCKERTWERKE GES. and HULSS [Motor control] 4,308/14.

**Electrometallurgy and Electrochemistry:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Manufacture of boron suboxide] 15,757/13.

**Heating and Cooking:** VENNER [Heating elements] 13,989/13.

**Incandescent Lamps:** JUST [Lamp filaments] 8,956/13; KLEIN [Lamps for advertising] 29,284/13.

**Instruments and Meters:** KELVIN & JAMES WHITE, FIELD and RENFREW [Mariners' compass] 11,503/13; RANKIN and ELECT. POWER STOR. Co. [Recording apparatus for accumulators] 12,527/13; SIEMENS BROS. & Co. and JACOB [Vector calculator] 20,907/13.

**Switchgear, Fuses and Fittings:** MEIKLEJOHN [Wall fittings] 13,588/13; TURNER [Switches] 14,112/13; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Protective devices] 15,550/13; BONHAM [Contact boxes] 19,085/13; DAVIDSON [Switches] 29,821/13; VON HUTSCHLER and ORDON [Switch] 7,562/14.

**Telephony and Telegraphy:** BARON (*Heimann*) [Automatic and semi-automatic telephony] 11,590/13, 11,888/13; AUTOMATIC TELEPHONE MFG. Co. (*Automatic Electric Co.*) [Telephone systems] 11,998/13; INTERNAT. ELECT. Co. (*Akt. Ges. Mix & Genest*) [Microphones] 14,631/13; RICHARDSON [Mouthpiece attachment] 16,964/13; EASTERN TELEGRAPH Co. and JENKINS [Telephone receiver] 16,969/13; SIEMENS BROS. & Co. (*Siemens & Halske Akt. Ges.*) [Signalling arrangements] 2,092/14.

**Traction:** VON KANDO [Electric vehicles] 25,834/13.

**Miscellaneous:** WATKINS [Hair singeing] 10,105/13; WADE (*Leeson*) [Wire coil] 12,168/13; O'KEENAN [Clocks] 23,570/13; POETZELBERGER [Musical instruments] 26,388/13; KRAUS [Separator] 26,802/13; HARTMANN & BRAUN AKT. GES. [Condensers] 4,215/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors and Transformers:** SOC. ANON. DES AUTOMOBILES ET CYCLES PEUGEOT. [Dynamo machines] 11,089/14; SIEMENS-SCHUCKERTWERKE GES. [Speed regulator] 11,474/14; FÖRSTERSCHE MASCHINENBAU AKT. GES. [Conveyor motor] 11,746/14.

**Incandescent Lamps:** VON BATORKEZ and VERINKHAZ [Manufacture of lamp bulbs] 11,621/14.

**Switchgear, Fuses and Fittings:** SIEMENS-SCHUCKERTWERKE GES. [Fuses] 389/14; OSTERREICHISCHE SIEMENS-SCHUCKERTWERKE [Contacts] 11,410/14; COLLINS [Switchgear] 11,629/14.

**Telephony and Telegraphy:** FLEIJEL [Loading coils for telephony] 8,184/14.

**Traction:** WASSON [Trolley retrievers] 27,163/13, 9,970/14; COLLINS [Control system for vehicles] 11,630/14.

**Miscellaneous:** OSTERREICHISCHE SIEMENS-SCHUCKERTWERKE [Jacquard machinery] 11,808/14; FEYER [Loom driving].

The following Amended Specifications may now be obtained:—  
Incandescent Lamps: J. KREMENEZKY [Manufacture of tungsten wires] 3,112/13.

## Opposition to Grant of Patents

6,421/13, 5,501/14. **Earthenware Insulators.** H. L. DOULTON and H. MORRIS. Opposition to grant of the above Patents has been entered.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

10,637/00. **Variable Resistance Boxes.** A. H. MAYES. The resistance material consists of powdered carbon or similar substance which is contained in the several compartments of a non-conducting box. The partitions consist of copper plates which are connected to the stops on the controller. The resistance is altered by adjusting the pressure on the resistance material. This is done by means of set screws which bear on a pressure plate resting on the loose material. The latter plate must be non-conducting. Five figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** A. ECKSTEIN and A. E. ANGOLD [Clutch feeding mechanism] 3,562/05.

**Distributing Systems, Cables and Wires, &c.:** E. E. E. F. CREIGHTON [Lightning arresters] 26,642/07; W. H. EXLEY and H. LEITNER [Wiring system] 4,066/08.

**Dynamos, Motors and Transformers:** C. E. BONINE [Regulation of dynamos and motors] 28,503/06.

**Ignition:** ELECT. IGNITION Co. and F. H. HALL [Contact breaker] 4,057/06.

**Incandescent Lamps:** A. JUST, F. HANAMAN, H. LANDSBERGER and I. SALZMANN & VEREINIGTE ELECT. GES. [Manufacture of metallic filaments] 4,081/06; E. BÖHM [Lamp bulbs] 3,897/09; B. T.-H. Co. (*G. E. Co., U.S.A.*) [Manufacture of squirted tungsten filaments] 3,951/09; BERGMANN ELEKTRICITÄTS WERKE AKT.-GES. [Filament joints] 9,265/09.

**Traction:** E. H. JOHNSON [Electric brakes] 4,119/07; J. POLKEY [Vehicle lighting] 4,117/09.

**Miscellaneous:** W. BOTTOMLEY (*T. Cahill*) [System of producing and distributing music electrically] 3,666/03, 3,666a/03; C. WEINER [Electro-musical apparatus] 4,011/06.

## ELECTRIC TRACTION NOTES

Until to-day we have not considered it necessary to deal with Monsieur Emile Bachelet's so-called "levitated" railway in this column, which is, as a rule, confined to matters of practical importance, but the endeavour of this hitherto unknown inventor and his associates to secure £90,000 from the general public for the development of an absurd method of electric traction calls for some comment. M. Bachelet has constructed a model of a railway in which magnets placed along the line produce eddy currents in aluminium plates fixed underneath the car, and lift it off the ground; the car is then drawn along by the magnetic attraction of solenoids fitted with automatic make-and-break contacts. The thing may make a pretty toy, but the exhibition and toy rights, which are the only ones possessing some possible value, have already been disposed of, and are not to be the property of the new company for which the £90,000 is asked. Obviously the enormous amount of power which would be required to propel a car in this manner, and the enormous expense of the electro-magnets and solenoids would make any economical practical application for commercial carriage of passengers, goods, or mail matter, an impossibility. No expert opinion on the two patents out for the device, and no independent engineer's report, accompanied the prospectus. Up to the time of going to press we have been unable to ascertain whether the public have been foolish enough to subscribe to a sufficient extent to enable the company to be floated. It is with some surprise, however, that we read in the *Financial Times* that Mr. W. P. Durnall is to act as Consulting Engineer, in conjunction with M. Bachelet.

The accounts of the Lorain surface-contact system at Wolverhampton for last year show that the working costs per car-mile have, as a matter of fact, increased to 6·651d., as against 6·272d. in the previous year. The increase, however, is in a large measure due to an alteration in the assessment of the undertaking from £2,500 to £5,294. The financial result is a net profit of £5,553.

Mr. J. W. Hame, General Manager of the York Corporation Tramways, has reported unfavourably with regard to the adoption of the "pay-as-you-enter" system, in view of the York system being a narrow gauge one.

In connection with the proposed purchase of the Bristol Tramway Co.'s undertaking by the Corporation, Mr. J. M. McElroy, General Manager of the Manchester Corporation Tramways, has been advising the Bristol Corporation. In his report he states that, having studied all means of passenger transportation in the United States, Canada, and the Continent, as well as in the United Kingdom, he has yet to find evidence of the probability or desirability of scrapping tramways and substituting motor omnibuses.

The annual report upon the Dolter surface-contact system at Lincoln shows that the total costs are again lower than those of the Lorain system in Wolverhampton. The comparison of 5·91d. for Lincoln with 6·27d. for Wolverhampton, however, is between 1913-14 at Lincoln and 1912-13 at Wolverhampton. The system continues to work quite satisfactorily, and without incident. The total working costs of 5·91d. per unit are lower than any year except 1908-9.

The Cayenne-Salinas cable is still down, and the Saigon-Bangkok cable is repaired.—On the 4th inst. communication with Siam *via* Moulmein-Raheng and Moulmein-Kanburi was down, and telegrams for Siam were sent *via* Madras-Saigon at rates ruling for that route until the 8th inst., when repairs were effected.—The Commercial Cable Co. has one of its Atlantic links in trouble, and repairs are being taken in hand by their own ship.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The report of the Committee on Wireless Telegraphy Research, appointed by the Postmaster-General, has now been issued. This Committee was formed to consider and report how far and by what methods the State should make provision for research work in the science of wireless telegraphy, and whether any organisation which may be established should include problems connected with ordinary telegraphy and telephony. The report states that, although valuable research work is already being done by the Post Office, the Admiralty, and the War Office, this is for various

reasons necessarily restricted in its scope, and remarks that both in the United States and in Germany more extensive provision for experimental work is made. The Committee considers it desirable to establish a National Telegraphic Research Committee, somewhat on the lines of the Advisory Committee for Aeronautics, to initiate and to control research in matters of general principle which cannot conveniently be investigated in departmental laboratories, to co-ordinate, as far as may be, the work now undertaken by the Post Office, Admiralty, and War Office respectively, in connection with experiment and research in wireless telegraphy, so as to prevent work undertaken by one department overlapping work undertaken by another, and thus secure economy, and to discuss any difficulties arising in practice. The establishment of a research laboratory is recommended, in which research work bearing on the practical needs of the services should be carried out under the guidance of the Committee. The scheme is formulated in some detail. It is proposed that the Permanent Committee include representatives of the Admiralty, the War Office, the Post Office, and the Treasury, as well as the Director of the National Physical Laboratory. Two of the Treasury members would be nominated by the Royal Society, and one by the Institution of Electrical Engineers. The Laboratory would be established at the National Physical Laboratory, with a special premises and staff. The cost of the building and equipment is estimated at £7,300, and the annual expenses at £4,800. The following is the schedule of work proposed:—Improvements in methods of measurement of fundamental electrical quantities under high-frequency conditions. Measurement of efficiency of dielectrics of transmitting condensers used at different voltages, frequencies, and temperatures; quantitative results by which losses can be predetermined. Behaviour of insulating materials at high frequencies and voltages, and best methods of use. Efficiency of different types of receiving condensers. Study of details of design of transmitting and receiving inductances with a view to minimising energy loss. Investigation of crystal and valve detectors under different conditions, and best methods of modifying these to obtain desired characteristics. Effect of variation of coupling between detector circuit and the rest of the receiving circuit. Effect of variation of inductance and capacity in receiving circuit. Methods of mounting and preparing crystals. Methods of amplification of received signals, both acoustic and electrical. Measurements of losses due to brushing from different types of aerials at high frequencies. Measurement of decrement of aerial and earth system. Conductivity of different kinds of soil at high frequencies. Measurement of losses in steel plate earth connections. Measurements on model aerials to assist in design and to predetermine losses. Investigation of "earth antennæ." Investigation of new systems of wireless telegraphy and apparatus employed therein.

Mr. George Franklin presided at the annual meeting of the Constantinople Telephone Co. in Constantinople last week. It was stated that the prospects of the Company are very encouraging, orders having already been received for about 4,800 stations.

The Post Office has taken over the Portsmouth Corporation telephone system at the price of £35,000. This leaves Hull the only municipal telephone system in the country. The Post Office contemplates the erection of a new central exchange, and equipping it with standard apparatus. The Portsmouth licence was obtained in 1901, and had twelve years to run. The purchase price has been agreed upon after a fairly large allowance for depreciation.

**Obituary.**—We regret to announce the death on Saturday, May 30th, of Mr. S. L. Bentley, partner in the firm of H. W. Butler & Co., after only eight days' illness. Mr. Bentley studied in the Polytechnics of Buda-Pesth and Zurich, and also in the Polytechnic School in Paris, and was a member of the Société Internationale des Electriciens. He joined the E.P.S. Co. in 1900, acting as their representative at the Paris Exhibition of that year, and also at the Glasgow International Exhibition of the following year. He was for several years stationed in Glasgow, as their representative for Scotland, subsequently adding to this the north of England. He left them in 1912, and joined Mr. H. W. Butler as partner.

**University College.**—A Heating Studentship tenable in the Faculty of Engineering of University College, London, of the value of £50 a year, together with £11 11s., being the amount of College fees, may be awarded by the Institution of Heating and Ventilating Engineers in July. The student will be required to devote his whole time to research work in heating and ventilating engineering. Further particulars can be obtained from the Secretary of University College, to whom application should be made on or before Saturday, June 20th.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 333. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**ROTARY STRAINER FOR CONDENSING WATER.**—The London Electric Supply Corporation, Ltd. (25a Cockspur Street, London, S.W.), have issued a pamphlet with regard to their patent self-cleaning water strainer for condensing plants and other purposes, which has been in use at the Deptford generating station for the last three and a half years, and is also in use at the L.C.C. tramway generating station, the West Ham electricity works, and the Sheffield electricity works. The Company have found that the strainer is effective at their own station with the very dirty Thames water, and are now manufacturing similar strainers for use elsewhere, in the ordinary way of business. Illustrated descriptions of the strainer appeared in our columns of May 11th, 1911, and June 12th, 1913.

**WIRELESS TELEGRAPHY.**—A new catalogue dealing with apparatus on the quenched spark system for ships has been issued by Siemens Brothers & Co., Ltd. (Woolwich). We understand that this system is now installed on over 100 British vessels. Particulars of a number of these installations are given in the list. The standard ship sets range from the little launch outfit of 0.3 kw. with a guaranteed range of 18 to 30 miles, to the 5 kw. equipment for liners, of a guaranteed range of 280 to 550 miles. Some interesting figures of tests of two sets guaranteed at 300 miles at night show that communication has frequently been established over 1,400 to 1,700 miles. The use of the pamphlet is enhanced by the inclusion of all the important regulations regarding wireless telegraphy by the recent committee for safety of life at sea. Full illustrated descriptions are contained of the different types of equipment on the Siemens-Telefunken system.

**EDISON ACCUMULATORS.**—The constructional features of the Edison nickel-iron alkaline storage battery, together with interesting information as to the remarkable results of tests of its mechanical and electrical strength, are treated in a new booklet from Edison Accumulators, Ltd., Edison Building, 2 and 3 Duke Street, Piccadilly, S.W. The cells are now made in nine different sizes, ranging from 50 to 600 watt-hours capacity. The weight of the largest of these cells is 45 lb.

**CASCADE MOTORS.**—A detailed price list of every size and variety of the Hunt patent "Cascade" single-speed induction motors without sliprings is to hand from Sandicroft, Ltd. (Chester).

### INDIRECT LIGHTING

**EXAMPLES** of indirect lighting by suspended bowl fittings as developed by the British Thomson-Houston Co., are familiar to our readers. The firm have now sent us some particulars of recent installations where indirect illumination is effected entirely without suspended fittings. One case is

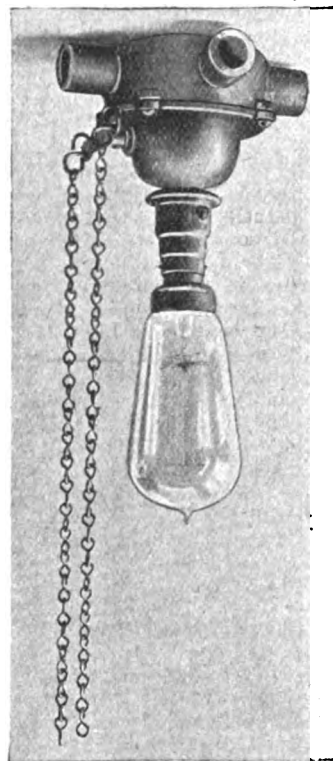


CHURCH LIGHTED BY INDIRECT ILLUMINATION.

a drawing-room lighted by one of their table standards with the upturned reflector concealed in the shade. Another case is a bank in which the reflectors are in troughs on the top of screens, while the third, of which an illustration is given here, is a church which happens to have a white ceiling, and is very effectively lighted from the cornice.

### A WATERTIGHT PULL SWITCH FITTING

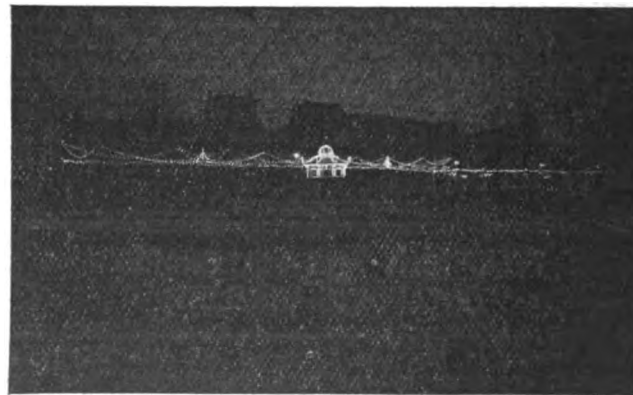
THE illustration shows a special fitting which has been designed for factory installations by Simplex Conduits,



Ltd., Garrison Lane, Birmingham, and wherever installed found to be most convenient and suitable for the severe conditions in this class of work. It is designed to provide a convenient form of pull switch, and consists of a specially watertight box with 5-ampere standard type of switch fitted inside, operated externally by a lever and chain. The movement is similar to that in the Company's standard form of watertight switch, and gives a very quick and independent break. The dome cover, as will be seen from the illustration, is fitted with a standard type of watertight lamp-holder, so that in this case the light would be actually on the ceiling; but where required the fitting can be provided with any length of tubing drop, so as to lengthen the distance between the light and the ceiling.

### SEA FRONT ILLUMINATION BY METAL FILAMENT LAMPS

A LARGE installation of Pope "Elasta" British-made wire lamps has recently been made at Hastings, where the whole of the band stand and the front is illuminated with 4,000 of these lamps. The excellent effect produced at night



HASTINGS SEA FRONT AT NIGHT.

is seen by the photograph reproduced here. In spite of the exposed position in which the lamps are burning, the fact that they have been running for some considerable time with practically no failures speaks highly for their durability.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Antwerp.**—The Council requires a supply of armoured cable.

**Australia.**—Rotary-converters and frequency changers are required in connection with the electrification of the Melbourne suburban railways. Consulting engineers, Merz & McLellan, 32 Victoria Street, S.W. July 6th. (See advertisement on another page.)

**Bexley.**—A Local Government Board inquiry was held last week concerning a loan of £8,000, made up as follows:—Mains, services, and transformers, £2,500; generating plant, £5,500. There was opposition to the proposal by the local Traders' Association so far as the expenditure on new generating plant is concerned, the argument being that it would be more profitable for the Council to purchase further electrical energy in bulk. It was pointed out, however, on behalf of the Council, that although the Woolwich Borough Council had offered to give a supply in bulk, there were technical difficulties in the way of taking it, whilst further, the supply would not be available during the ensuing winter, when it would be needed in Bexley. At present there is not only no spare, but insufficient plant with all sets running, to meet the maximum demand.

**Bolton.**—Converting plant and sub-station switchgear. Borough Electrical Engineer. July 9th. (See advertisement on another page.)

**Farham.**—New cables and transformer.

**Farnworth.**—The Council is applying for sanction to a loan of £1,500 for a three years' requirement of cables.

**Hereford.**—Loans of £530 for new plant, £500 for a new chimney, and £240 for mains, are to be applied for.

**Irvine (N.B.).**—An agreement is to be signed with the Kilmarnock Corporation for a supply of electrical energy in bulk.

**Manchester.**—Transformers, motors, meters, and starting switches. Chief Electrical Engineer. June 26th. (See advertisement on another page.)

**Nairobi.**—A new issue of capital is to be made by the Nairobi Electric Power & Lighting Co. in order to provide for additional generating plant.

**Pickering.**—An agreement for the supply of electrical energy by the Yorkshire Electric Power Co. has been sealed.

**Stalybridge.**—The Joint Board requires a twelve months' supply of various stores for the electricity and tramways department.

**Stretford.**—Lighting battery, booster, and switchboard. Borough Electrical Engineer. June 15th.

**Sunderland.**—A loan of £12,000 is to be taken up for additional generating plant and switchgear.

**Sydney.**—The Municipal Council requires a supply of 33,000-volt insulators; also two coal conveyors with motors, &c. City Electrical Engineer, Queen Victoria Markets, Sydney, N.S.W. July 20th. Further particulars at 78 Basinghall Street, E.C.

**Teignmouth.**—Negotiations are proceeding between the Council and Dr. J. A. Purves, of Exeter, who expects to be able to supply the district within twelve months.

**West Ham.**—A Local Government Board inquiry was held last week concerning a loan of £6,706 for electrical extensions.

**Worcester.**—The Electricity Committee recommends application being made to the L.G.B. for sanction to the following loans:—Mains in conduits, £2,500; mains direct in ground, £1,000; overhead mains, £500; transformers, £750; sub-station equipment, £500.

### Wiring

**Antwerp.**—Electric lighting of two sheds at the Canal Dock.

**Christchurch.**—Electric lighting of workhouse, infirmary, &c.

**Guildford.**—New telephone exchange. H.M. Office of Works, London.

**Leeds.**—Lighting, bells, and telephone installation at the Grange Hostel, Becketts Park, Headingley. Secretary, Education Department. June 17th.

**London.**—Public offices extension, Westminster. H.M. Office of Works. June 30th. (See advertisement on another page.)

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Blackburn.**—Mill extensions, Moorgate Street. E. Hamer.

**Cambridge.**—Children's Home in Ross Street.

**Crewe.**—New shops. F. Denson.

**Dover.**—New County School for Boys. Kent Education Committee, Maidstone.

**Gillingham.**—New swimming baths.

**Ilkeston.**—Cinematograph theatre.

**Lancaster.**—New school.

**Luton.**—New school.

**Norwich.**—Extensions of municipal offices (£12,800).

**Wigan.**—High School for Girls. Architects, W. C. Ralph & Sons.

**Yarmouth.**—New school.

### Miscellaneous

**Lisnaskea.**—A Local Government Board inquiry has been held with regard to a loan for the purpose of public lighting.

**London: Metropolitan Asylums Board.**—Telephone and bell installation at Orchard Hospital, near Dartford. Engineer to Board, Victoria Embankment. June 17th.

**Watford.**—A report is being prepared upon improving the lighting of a portion of the High Street.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Bacup.**—The tender of Messrs. W. T. Glover & Co. has been accepted for supplying and laying cable.

**Cardiff.**—The following tenders have been accepted:—Steampipes, &c., Babcock & Wilcox; power-station switchgear, British Westinghouse Co.; transformers, Siemens Bros. & Co.

**York.**—The tender of the General Cable Manufacturing Co. at £6,357 13s. has been accepted for high- and low-tension cable.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**British Electrical Federation.**—The summary of statistics for 1913 of the companies forming this Federation shows that there was a net revenue, before providing debenture interest, reserves and dividends, of £1,281,698. The debenture interest and dividends paid for the year amounted to £858,533, and the reserves, including the addition of £407,863 for the year 1913, now stand at £2,176,599. The number of route miles worked by the federated tramways and light railways is now 429.77, and the capacity of plant installed for electric supply, excluding purely traction stations, is 38,572 kw. There are now some 60 companies in the Federation.

**Birmingham District Power & Traction Co.**—An improvement in both the traction and lighting sections of this company's business was reported at the annual meeting last week. The whole of the lighting undertaking, however, has now been sold to the Shropshire, Worcestershire & Staffordshire Electric Power Co., and in future the Birmingham Company will be a holding company in the Power Company.

**Nairobi Electric Power & Lighting Co.**—Negotiations have been completed with the Government for the extension of the company's concession from 25 to 50 years, and the grant of important falls on the Thika River for the generation of electricity.

**Low-voltage Half-watt Lamps.**—The low-voltage half-watt lamps, referred to in our issue of May 28th, for use with small transformers, are now listed in Germany in five sizes: 50 c.p. lamps are made for 14 volts only, and 100 and 200 c.p. for 14 or 25 volts. The price of the 50 c.p. lamp (which consumes 28 watts) is only 1.75 marks, plus 0.20 mark lamp tax, on the German market; the 100 c.p. lamp costs 2.50 marks, plus 0.40 mark tax; and the 200 c.p. lamp 4.50 marks, plus 0.60 mark tax. The lamp-holder transformers for the 14 volt 50 c.p. lamps are stated to have an efficiency of 83 per cent., and cost from 9 to 10 marks.



## LOCAL NOTES

**Bolton: Electricity Profits and Rate Aid.**—A motion at the last meeting of the Corporation to move back a recommendation of the Electricity Committee allocating £2,000 from electricity profits in relief of rates was defeated. Councillor Peters, who moved the reference back, argued that the depreciation and renewal fund is not as large as it should be, but there was a big majority in favour of relieving the rates, as suggested by the Committee.

**Cleckheaton: Position of Electricity Undertaking.**—The municipal electricity undertaking has entailed some loss since its inception, and the question of dealing with it has been given some consideration from time to time. At the last meeting of the Council the newly-elected Chairman of the Electricity Committee made a definite statement that the Council has decided not to part with the undertaking in any circumstances.

**Croydon: Electricity Accounts.**—There was a net profit of £1,877 upon the electricity undertaking last year. This result, however, is obtained after charging £8,206 to revenue, the greater portion of which is in the nature of capital. The net profit has been credited to appropriation account, which now stands at £2,284, and this amount it is recommended shall be transferred to reserve and renewals fund.

**Dundee: Excessive Rating of Electricity Department.**—Speaking at the last meeting of the Corporation, the Convener of the Electricity Department pointed out that the electricity undertaking is far more handicapped in the matter of rating than any other of the municipal departments. The Tramway Department, with an income of £69,000, pays only £1,900 per annum in rates, and the Gas Department, with an income of £158,000, pays £5,800 per annum, whereas the Electricity Department, with an income of £61,000, pays no less than £6,500 per annum. The difference is accounted for by the fact that the other departments only pay 25 per cent. on their rails and pipes respectively, whereas the Electricity Department has to pay the full value on all cables.

**Electricity Records.**—The revenue from the Electricity Department last year was £58,783, an increase of nearly £5,500 over the previous twelve months. The net profit amounted to £5,150, but the deficit on the Broughty Ferry Works reduced it to £3,507. The number of units sold increased by two millions.

**Edinburgh: Reduced Cost of Public Lighting.**—The Electric Lighting Committee recommends the Corporation to reduce the charge for public lighting from £9 to £7 10s. per annum.

**Leigh (Lancs.): Electricity Accounts.**—The number of units sold last year shows an increase of 22 per cent. over the previous twelve months. With regard to the new scheme now in hand, Mr. H. R. Hooper, the L.G.B. Inspector, at the recent inquiry, suggested that a more suitable site should be found for the generating station in order to supply at the lowest possible price the very considerable demand for cheap power which exists in the district. The attention of the Committee is drawn to this matter by the Borough Electrical Engineer in his report. The financial result shows a net profit of £1,154, against £1,080 in the previous twelve months. At the same time, the average price has dropped from 2.06d. to 1.94d. per unit.

**Lytham: Bulk Supply.**—The Local Government Board states that it is unable to deal with the Council's application for sanction to a loan for electric lighting until the St. Anne's Council has obtained the necessary powers enabling them to give the proposed supply in Lytham.

**Manchester: Tour of Inspection.**—The Chairman and Deputy Chairman of the Electricity Committee, together with Mr. S. L. Pearce, the Electrical Engineer, have been authorised to visit Paris, Berlin, a number of American cities, and Montreal, in Canada, to inspect the large generating stations there, and acquaint themselves with the general conditions of extra high-voltage transmission systems abroad.

**West Bromwich: Low Electricity Profits.**—In drawing attention to the fact that the net profit on the electricity undertaking last year was only about £30, compared with a profit exceeding four figures in the previous twelve months, the Borough Electrical Engineer points out that this is mainly due to the increased price of coal, which now stands at 8s. 2d. per ton, against 5s. 3d. A higher-grade fuel was purchased under the last contracts, but the results have not justified its continuance. In addition, the rates and taxes

have increased by £250. At the same time, the opinion is expressed that the rates charged for lighting and power purposes are too low, but that if the redemption of borrowed capital could be continued at 4½ per cent. per annum, and a small balance shown on the right side, the financial position ought to be regarded as reasonably sound.

## APPOINTMENTS AND PERSONAL NOTES

At an Extraordinary Meeting of the Council of the British Electrical and Allied Manufacturers' Association on Monday, the following resolution was passed:—

Resolved that the Council of this Association, in meeting assembled this 8th day of June, 1914, deplore the untimely death of their late Chairman, A. Bruce Anderson, who perished at the sinking of the *Empress of Ireland* in the St. Lawrence River, on the 29th of May, and desire to place on record not only the loss of the chief executive officer of the Association, but also the loss of a personal friend; and that a copy of this Resolution be sent to Mrs. Anderson with an expression of their deepest sympathy for her in her sad bereavement.

The Council of the Royal Society of Arts has awarded the Albert Medal for this year to Mr. G. Marconi, for his services in the development and practical application of wireless telegraphy.

Mr. F. H. Whysall, Resident Engineer at the Bloom Street and Dickinson Street Works of the Manchester Corporation, has been appointed Borough Electrical Engineer at Greenock in succession to Mr. J. A. Robertson, who a short time ago was appointed Chief Electrical Engineer to the Salford Corporation.

The Barnstaple Electric Lighting Committee recommends an increase in the salary of the Borough Electrical Engineer, Mr. J. W. Hadfield, from £200 to £225 per annum.

Mr. T. Hollins, Assistant Mains Superintendent at Watford, has resigned on receiving an appointment elsewhere.

Mr. Percy Taylor, an Assistant in the Darwen Corporation Electricity Department, has received an increase in his salary of from £91 to £104 per annum.

The salaries of Mr. T. Keenlyside and Mr. Hubert Simpson, Charge Engineers at the Crewe Electricity Works, are to be increased from £150 to £165, and from £100 to £110 per annum, respectively.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £64 5s. to £64 15s. (Last week, £65 to £65 10s.)

**H. W. Butler & Co.**—We are informed by Mr. H. W. Butler (Craven House, Kingsway, W.C.) that since the death of his partner, Mr. S. L. Bentley, referred to in another column, arrangements have been made for the business to be carried on as heretofore.

**Holidays.**—Messrs. J. H. Tucker & Co.'s Works at King's Road, Hay Mills, Birmingham, will be closed on Saturday, the 20th inst., for the annual works trip to Blackpool.

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# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 390 [VOL. X., No. 25]

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THURSDAY, JUNE 18, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price **1d.**

### SUBSCRIPTION RATES.

United Kingdom. **6s. 6d.** per Annum.

Canada. **8s. 8d.** per Annum.

Other Colonies and Abroad. **13s.** per Annum.

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 205-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE Annual Convention of the Incorporated Municipal Electrical Association opened at Birmingham on Tuesday, and we publish a report of the first two days' proceedings. A fuller report on the discussion at Coventry yesterday will appear in our next issue, together with Thursday's and Friday's proceedings. Between 350 and 400 members and visitors took part in the meeting. A list of those who had previously intimated their intention of coming was published in our last issue, and several more (including Dr. Ferranti and Mr. Robert Hammond) made up their minds to come at the last moment.

In his Presidential Address Mr. Chattock, Birmingham, made interesting comments with regard to the Model General Conditions of Contract, the I.M.E.A. Bill, the Electrical Vehicle Committee, and the death of the I.E.E. Industrial Committee, and made a suggestion for combined control of municipal gas and electricity undertakings. He then outlined a proposal for the centralisation of electricity supply, suggesting the possibility of a scheme under which it would eventually be possible to obtain, "at one rock-bottom price," a supply of electrical energy, for any purpose whatsoever. (Page 337.)

Mr. W. A. VIGNOLES (Grimsby) followed with some voluminous "notes" on the commercial development of supply in towns of moderate size. The Paper was, however, only read in abstract. The first part dealt chiefly with business-getting. Grimsby gives free advice to prospective consumers, and draws up a detailed specification and superintends the work at 2½ per cent. Hire-purchase of wiring has been well

developed, and the Corporation assists the contractors in financing such arrangements: Mr. Vignoles considered hire and hire-purchase powers vital, and recommended that if it would assist all municipalities to get these, the powers for wiring and selling should be dropped out of the I.M.E.A. Bill. In this he was supported by Mr. E. E. Hoadley (Maidstone), and it does not seem improbable that the matter will be raised at the Annual General Meeting to-morrow, together with the question of the establishment of a new Publicity Committee by the Association. Mr. Vignoles and Mr. F. Ayton (Ipswich) were strongly in favour of this. Mr. Vignoles was luke-warm with regard to the value of showrooms, and Mr. A. C. Cramb (Croydon) took a directly opposite view. The suggestion in the Paper that the reserve fund should be invested in the undertaking was not criticised, and the latter parts of the Paper dealing with financial control and the calculation of costs to arrive at an equitable tariff were hardly discussed. Much of the discussion centred around the evergreen question as to whether profits should be allocated to relief of rates. (Pages 340 and 347.)

Mr. S. E. FEDDEN's Paper yesterday, on the Design and Operation of Modern Boiler-House Plant, was based on his experience at Sheffield. It dealt particularly with the question of the disposal of ashes, the storage of coal, mechanical stokers, and live steam feed-water heaters, and it concluded with a threat of new conditions of high super-heat under which a dull red gas would be passed through the steam pipes and valves. (Page 343.)

IN connection with the visit of the I.M.E.A. to the Witton Works of the General Electric Co. a preliminary Press inspection was held last Monday, at which a large party went over the works described in our last issue, as well as the carbon works. (Page 345.)

THE motor vehicle parade at Birmingham was a great success; several of the cars had travelled down by road. (Page 346.)

AT the Annual Dinner a speech made by Dr. Ferranti clearly indicated that he was most antagonistic to the policy of the Institution of Electrical Engineers which resulted in the dissolution of the Industrial Committee. (Page 346.)

A BRIEF telegraphic report of yesterday's discussion on Mr. Fedden's paper appears on page 348.

THE poll of the citizens has resulted in favour of the purchase of the Bristol tramways by the Corporation. (Page 348.)

AN experimental wireless telephone conversation from the Eiffel Tower has been overheard by an amateur in England. (Page 348.)

THE arrangement of starting connections for single-phase induction motors to obtain maximum starting

torque are discussed in our Questions and Answers columns. (Page 349.)

A METHOD of rendering tungsten ductile by the addition of a small quantity of another metal is described in one of the specifications published last week.—A patent for the control of electric clocks expires this week after a life of fourteen years. (Page 350.)

In our Trade section are particulars of a large switch-gear contract and descriptions of some new conduit fittings, and a new electric motor-car horn. (Pages 351 and 352.)

TENDERS are invited for five 1,500-kw. rotary converters and transformers by the L.C.C.; switchgear for New Zealand; tramway stores at Rotherham. (Page 353.)

THE tender of the British Westinghouse Co. for a 5,000-kw. turbo-alternator at Salford has been accepted. (Page 353.)

THE *locus standi* of the Metropolitan Electric Supply Co. in objecting to the granting of powers for electric supply to the Brentford Gas Co. has been disallowed.—Considerable developments are taking place in the power load at Manchester. (Page 354.)

A COMPANY is being formed for the manufacture of coalite in Yorkshire. The surplus gas will be used for generating electrical energy. (Page 354.)

**The 15,000-k.w. Turbo-Alternator at Manchester.**—By an unfortunate error it was stated in an article last week, on p. 317, that the steam consumption of the new 15,000-kw. turbo-alternator at Manchester was 16.35 lb. of steam per kw.-hour at full load, with a steam temperature of 330° F. This should have been 13.65 lb. for a steam temperature of 590° F.

**The Paris Disasters.**—In connection with the extraordinary subsidences which took place on Monday in the streets of Paris as a result of the almost unprecedented storms, considerable damage has been done to the cable systems both of the electricity supply and telephones, particularly in the St. Lazare district, where the services were entirely suspended. In some places the tunnels of the Metropolitan electric railway have collapsed.

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JUNE 18TH.

*Incorporated Municipal Electrical Association.*

10.30 a.m. Birmingham Convention. Meeting at Memorial Lecture Room. "The Standardisation of Tariffs," by J. H. Bowden.

2.30 p.m. Trip to Warwick Castle.

8.30 p.m. Fête and Concert at Botanical Gardens. "Point Fives."

10 p.m. Meeting and Supper at Grand Hotel.

FRIDAY, JUNE 19TH.

*Incorporated Municipal Electrical Association.*

10 a.m. Birmingham Convention. Annual General Meeting at Midland Institute.

2.30 p.m. Visit to Summer Lane Power Station.

8 p.m. Cinderella Dance at Grand Hotel.

SATURDAY, JUNE 20TH.

*Incorporated Municipal Electrical Association.*

10 a.m. Birmingham Convention. Visit to Worcester.

THURSDAY, JUNE 25TH.

*Institution of Electrical Engineers.*

9 p.m. Conversazione at Natural History Museum, Cromwell Road, S.W.

## The London Electrical Engineers.

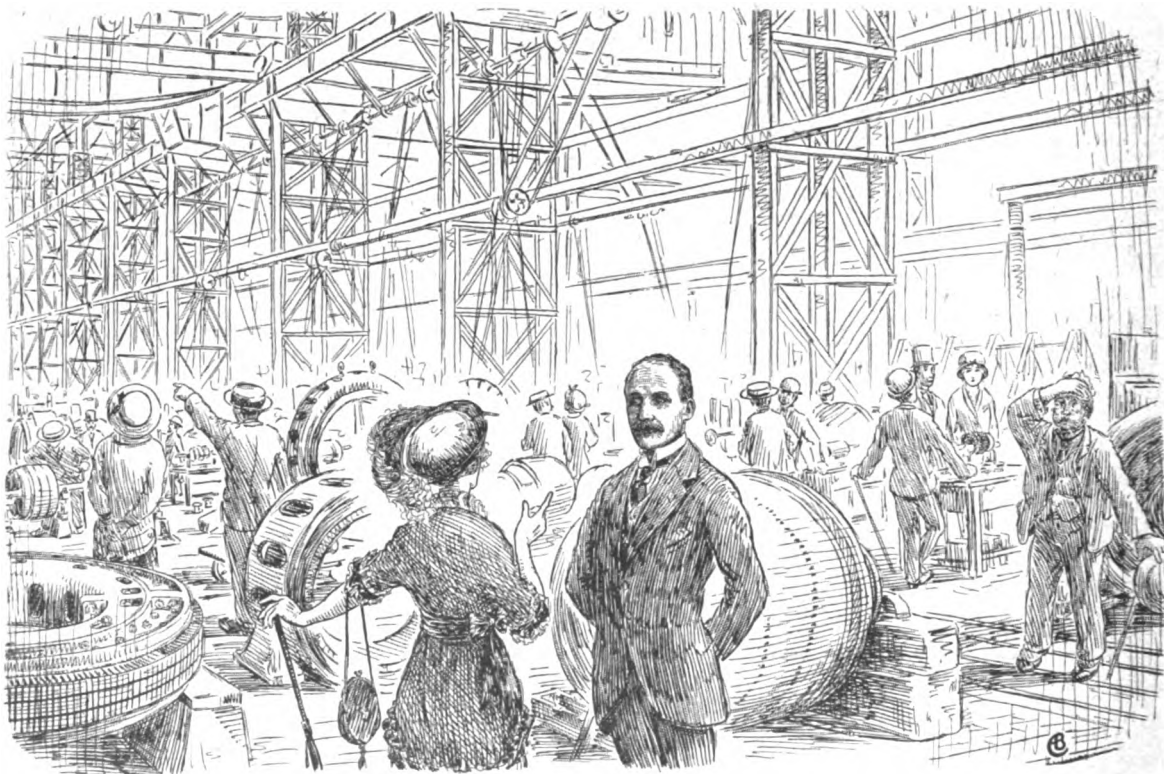
Headquarters (46 Regency Street, S.W.), open Sats. till noon.

Rating Exam. for all Co.'s from 7 to 8.30 p.m. on Wednesday.

(TO-DAY) THURSDAY, JUNE 18TH, C. Co., FRIDAY, JUNE 19TH.

D. Co., SATURDAY, JUNE 20TH, Annual Course of Musketry, all Companies. Purfleet. MONDAY, JUNE 22ND, A. Co., TUESDAY, JUNE 23RD, B. Co., Advance Party for Berchaven Camp parade at Hd. Qrs., 12 noon.

**Obituary.**—The death is announced of Sir Edward White, who was Chairman of the London County Council a few years ago. Prior to that Sir Edward had been Chairman of the Highways Committee, and as a member of the Council for St. Marylebone had also taken a considerable interest in the Marylebone electric lighting undertaking. We believe we are right in saying that although Sir Edward White was not an advocate of municipal trading, he nevertheless took the commonsense view that in Marylebone, having purchased the undertaking, it was the duty of everyone connected with the Council to do their best to develop it to the utmost extent, and not to put artificial obstacles in its way.



THE LIGHTER SIDE OF THE I.M.E.A. CONVENTION.

FAIR VISITOR: Do please show me a squirrel-cage motor; I do love the little animals, and have brought some nuts for them.

Dr. R—g is left thinking for a suitable reply.

## ANNUAL CONVENTION OF THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION

### PRESIDENTIAL ADDRESS \*

By R. A. CHATTOCK (*Chief Electrical Engineer, Birmingham.*)

THERE are several points on which I wish to touch before coming to the main portion of my address.

#### Model General Conditions.

It is a matter of regret that the contentious clauses have not yet been agreed between this Association and the British Electrical and Allied Manufacturers' Association. The issue of model general conditions by the Institution of Electrical Engineers without the approval of our Association, I feel, is the direct result of the strong opposition manifested by some of the members at the special meeting held in July last. The result is that these Institution model conditions which are at variance with our ideas in many respects, are now being put forward by manufacturers with the authority of the Institution behind them, and buyers are being obliged to accept them without much hope of negotiating alterations in them. I cannot help feeling that a very different result, and one more favourable to us, would have been obtained if members of this Association had adopted the carefully-considered recommendations of the Council twelve months ago, or possibly varied them to only a small extent, and allowed the negotiations with the manufacturers to go on with a view to an amicable settlement of points on which there was a difference between the two Associations.

As it is, the Council have discussed the contentious clauses and the suggestions made at the meeting in July last, with the Association of Municipal Corporations. This Association promised to take the matter in hand and draft clauses in legal terms which were then to be submitted to our Association. We have been waiting now for many months for this draft, and I fear that now, when it does come, it will be too late to have any real effect, in view of the model conditions that have now been issued by the Institution of Electrical Engineers.

#### Electric Lighting Bill, 1914

Everything has been done to try and get this Bill into Parliament. Negotiations were opened up with the Electrical Contractors' Association to try and get them to withdraw their opposition, in order that the Bill might go through unopposed. It was ascertained that many of the contractors were in favour of withdrawing opposition, and at one time it was even understood that this would be done. Subsequently, however, much to my disappointment, and, I think, of all the members of our Council, the opposition element in the Contractors' Association was successful, probably due to the action of those who are opposed to wiring being carried out by municipal supply authorities under any circumstances whatever.

Let us examine the position which would arise if these powers were obtained and exercised, because I believe the contractors exaggerate the quantity of work that it would be possible for a municipality to undertake. First of all, we seek these powers not for the purpose of securing more trade, but to ensure good work, especially in the cheaper classes of installations. The expensive work in hotels and good-class business houses and residences, which is well paid for, is, as a rule, well done. Moreover, there is the wiring work for telephones and bells which the contractors must obtain, because the municipality has no power to do it and does not seek such powers, with the result that a customer will probably prefer to place the whole order with one person instead of two. In addition, the contractor can calculate the profit on the whole combined order, and he could probably successfully compete in price with the municipality. With the cheaper work, the case is entirely different, the margin of profit is so small that the quality of the work often suffers, and the men who do it, as a rule, are not worth "going for" if trouble results. It is this jerry work that we want to eliminate. If we obtain the powers we seek, we shall be able to put to the contractors who are at fault that they must do good work or we will do the work ourselves. There is surely nothing to be alarmed at in this.

The opinion has been expressed that some of the supply engineers are inclined to be unfriendly towards the contractors, and that on this account it would be detrimental to the contractors to agree to wiring being carried out by a supply authority. There may, of course, be undertakings where things do not run smoothly between the engineer and the contractors, but I venture to think that these are few and far between and should not govern the general policy of an important Association such as that of the contractors.

In any case, I maintain that the idiosyncrasies of a few

engineers, and possibly also of a few contractors, should not be allowed to interfere with the well-considered policy of our Association in putting forward a scheme that all supply engineers, and, I venture to believe, all broad-minded contractors, consider to be in the general interests of the industry. Supply engineers, in order to hold their positions, must be good business men, and I cannot imagine a good business man following a policy of opposition and unfriendliness towards the contractors operating in his area. If he does such a thing, I think there is no doubt he would not occupy such a responsible position for any length of time.

I sincerely hope that a satisfactory agreement will be shortly arrived at. It is unthinkable that supply undertakings can do without electrical contractors.

#### Electric Vehicle Committee.

Considerable progress has been made during the past few months in developing the adoption of the electric battery vehicle in this country. I wish to impress upon members of the Association that it is impossible for the manufacturers themselves to give extended trials in more than a few towns. It is only by bringing and keeping these vehicles before the public that interest will be aroused in them, and for this purpose I consider that supply undertakings should be prepared themselves to bear some of the cost. Demonstration vehicles can quite well be used by municipalities for many of the operations that have to be carried out by them, such as street cleansing, collection of house refuse, conveyance of stores and materials between departments, &c. Money spent in pioneering work of this kind will, I am convinced, amply repay the supply undertaking. It also enables first-hand figures as to cost of operation to be given to prospective users. There is no doubt that in a large city many thousands of pounds of revenue will be obtained annually from the use of these vehicles when their adoption becomes general.

I would here like to remind you that, up to the present, the expenses incurred by the Electric Vehicle Committee have been met out of the funds of our Association. They estimate that during the coming twelve months their requirements in this respect will amount to about £200, and, with a view to meeting this expenditure, they are approaching the various municipal electric supply undertakings with a request that they should each contribute from one to three guineas towards this fund. They have also approached the manufacturing firms and others interested commercially in the movement, and I am glad to say have been met by a very liberal response.

#### The Industrial Committee of the Institution of Electrical Engineers.†

As a member of the now defunct Industrial Committee, I should like to explain to you exactly what was in their minds when they framed the resolution, which resulted in the dissolution of the Committee by the Council of the Institution. They recognised that in all industrial concerns, differences of opinion must arise on matters of policy and detail, and the same thing applies to the operations of the various existing associations, which are bound to come into conflict with each other at times. Such points of disagreement are usually settled by meetings and discussions between the associations concerned. Occasionally, however (and I venture to suggest that the present disagreement between us and the Electrical Contractors' Association over the wiring clauses is a case in point), disagreements arise which it appears almost impossible to settle. The Industrial Committee felt that a case of this kind was one in which they should be in a position to assist, and, if necessary, offer to arbitrate, and, in view of their not being able to do this under their constitution, they felt that some body should be called into existence which would be capable of offering its services in such an eventuality.

I am of the opinion that all the associations connected with the electrical industry (and there are many of them) should form from their members a central association, which could arrange conferences to consider disagreements between individual associations, and, if necessary, arbitrate upon the same, and which could be called together by any individual association requiring support in its operations, whether political or industrial. It rests with the various associations themselves to form such a body. It is obvious, I think, that the many and varied interests represented on the Council of the Institution of Electrical Engineers, which interests are largely individual and not really representative of the various associations, render it impossible for the Council to deal with disagreements between individual associations in the way that a body such as I have outlined could.

\* Slightly abridged.

See also ELECTRICAL ENGINEERING, May 21st, p. 281, and May 28th, p. 292.



### Combined Control of Municipal Gas and Electric Supply Undertakings.

I do not know whether the members of this Association read the very interesting address given by Mr. J. J. Newbigging, President of the Manchester District Institution of Gas Engineers, last month. The address was very fully reported in the issue of the *Gas World* dated March 7th, 1914. Towards the end of the address, Mr. Newbigging touches upon competition with electricity, and, coming as they do from the chief gas engineer to the Manchester Corporation, his remarks provide ample evidence that gas undertakings are beginning to fear the competition of electricity.

Mr. Newbigging did not refer to the real reason why electricity has been coming to the front so much faster than gas. This is undoubtedly due to the great reduction that has been made in the average price at which electricity is now sold to the consumer as compared with gas. A comparison of the Birmingham figures will be interesting: In the year 1901 the average net price of gas in Birmingham was 26·68d. per thousand cubic feet. In the year 1914 this has dropped to 19·41d. per thousand cubic feet, which is equivalent to a reduction to the consumer of 27·3 per cent. in the average price at which he is charged. In 1901 the average price received for electricity per unit was 4·37d. In 1914 this has dropped to 1·15d., a reduction of 73·6 per cent. in the price charged to the consumer. [Applause.] Here we have the real reason why gas is beginning to feel competition with electricity.

Mr. Newbigging makes some interesting suggestions by which gas undertakings could improve their position. He suggests supplying gas engines on hire purchase terms; this, I believe, has already been tried by some undertakings, and in this city at least it was discontinued. He also emphasises the point that the gas distributed should be absolutely regular in composition and be maintained at a constant and minimum pressure available to every consumer. The composition of gas distributed is, I believe, generally maintained satisfactorily, but the pressure at which it is supplied to consumers undoubtedly varies between very large limits in the outlying parts of a city, where it is used for lighting and where a constant pressure is most important. If competition with electricity will have the effect of making gas engineers recognise their responsibility in this direction, I am sure that even gas consumers will bless the introduction of electricity.

Another suggestion that Mr. Newbigging makes is that a competent staff of highly trained fitters should be established to clean consumers' burners free of charge and supply mantle renewals at cost price. An organisation of this kind, to deal with many thousands of consumers, must mean a very heavy expense. The idea suggested to the lay mind is that gas burners must be very unsatisfactory pieces of apparatus if they require frequent attention by highly trained fitters to keep them in proper order. Here, again, the gas consumers ought to be obliged to the competition of electricity for compelling the gas undertakings to look after their interests better.

Mr. Newbigging then goes on to suggest a combined control for municipal gas and electricity undertakings. I was under the impression that, when the question of combined control was raised early in 1911 between the gas and electricity committees of the Manchester Corporation, it was decided that the two committees should remain separate. The same question was discussed in Birmingham about the same time with a like result. I am of the opinion that the single control of gas and electricity undertakings would mean the total suppression of competition. [Cheers.] Instead of tending to foster keen rivalry between the two departments, it would effectually destroy that desire amongst the staff to improve upon previous records that is such an immense factor in the success of these public supply undertakings. To stifle this would be to deprive the ratepayer of the only real guarantee that he has for the most economical administration of both departments. Mr. Newbigging's charge that prices for current were sometimes cut down to an unjustifiable figure to secure business cannot be substantiated.

The sale of gas is largely controlled by the amount the undertaking can obtain for its by-products. This amount is frequently greater than the gross profits earned during the year. The electricity department has no by-products to sell except the useful employment during the hours of small demand of the generating plant and underground distributing mains, which have been purchased to supply the maximum load demanded during the winter months, and low quotations for current of high load factor are perfectly justifiable under these conditions. They are not given with the sole object of securing business, but to reduce the average cost of giving the supply, to the benefit of the whole of the consumers. [Applause.]

I maintain that it would be impossible for one manager and one Committee to work both departments in the interests of both classes of consumers. A man must become biased to a certain extent in favour of one or other of the branches of the supply, and it would be practically impossible for him to give an unbiased recommendation to his Committee on a point involving, for instance, whether the development of some new

area should be carried out by gas or electricity. Consumers would resent being told that they could only have one or the other, and such a policy would undoubtedly have the effect of driving manufacturers and others away from the city, whilst it is more than likely that the Board of Trade would be inclined to admit outside competition from power companies if they found that the statutory obligations for giving a supply were not being properly carried out.

There is no evidence whatever that the existing methods of single control of both gas and electricity undertakings have been unsuccessful. There is a field for both of them, as is shown by the increased outputs of both that are recorded year by year, and until such evidence is available, single control should not be considered.

### Centralisation of Electric Supply Undertakings.

Signs have not been wanting for some years past that the question of bringing isolated electric supply undertakings under one central system of supply has been occupying the attention of electrical engineers. Especially has this been the case in London, where attempts have been made to amalgamate the various companies by the formation of a central supply company. More recently the London County Council has been making very exhaustive inquiries into the same subject, and there is reason to believe is strongly in favour of centralisation of all the supplies, whether company or municipal. In the provinces, too, the larger municipalities have been extending their boundaries, and incidentally taking over the electric supply undertakings belonging to the areas incorporated, with distinctly beneficial results to themselves and to the areas taken over. Parliament has also recognised the principle by agreeing to the formation of the various power supply companies which are operating in several counties.

All these instances are steps in the right direction, though we are as yet a long way off the goal—where it will be possible to obtain, all over the country and at one rock-bottom price, a supply of electrical energy for any purpose, such as power, heating, lighting (and this will ultimately be such a small percentage of the whole that the poor load factor can be safely ignored), domestic requirements, traction by rail, road, or tramway, &c.

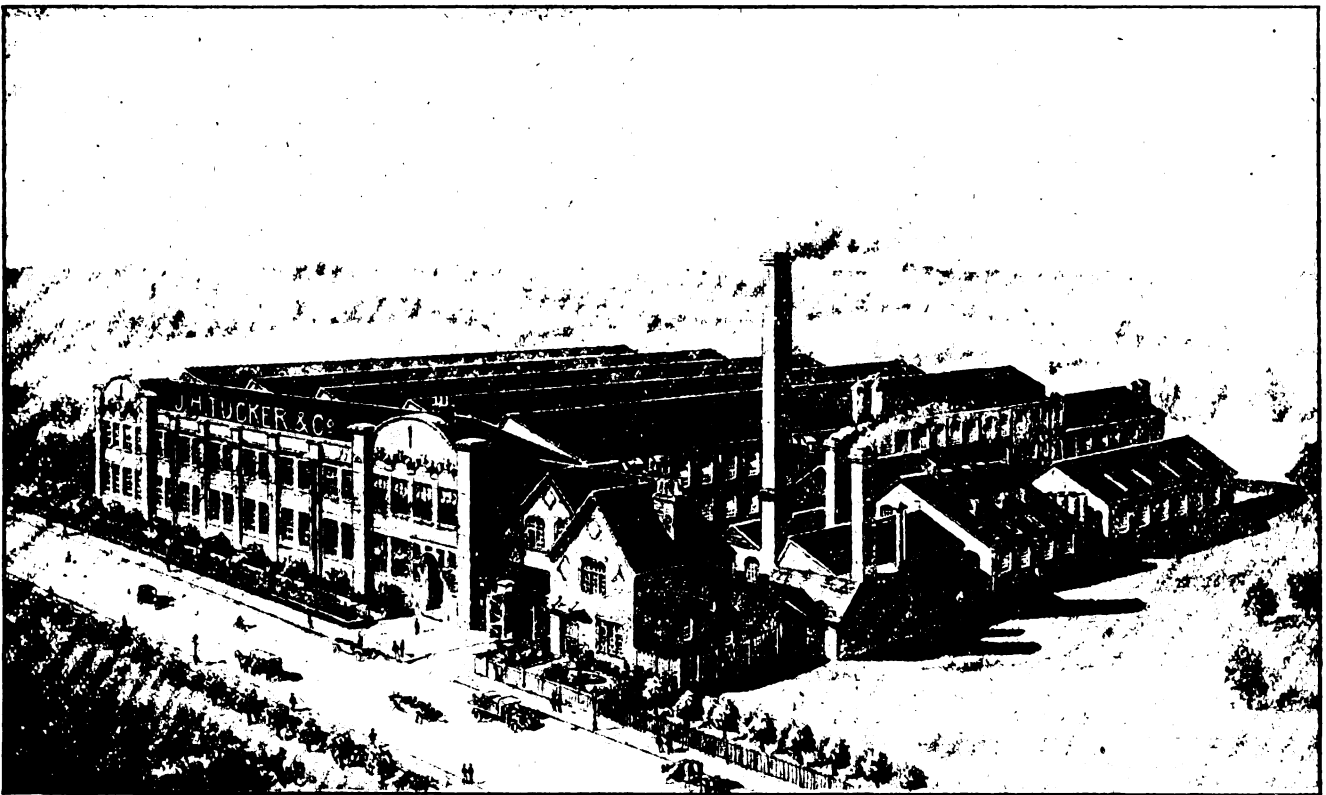
We are a nation of manufacturers, and to a large extent every inhabitant of this island is dependent upon our maintaining our position in the markets of the world. Our manufacturing factories can only hold their own in these markets if they can produce as cheaply as possible, and one most important consideration towards this end is the provision of cheap power and cheap transit for both goods and workmen. Other countries are recognising this; America and Germany, our two greatest trade rivals, are establishing centrally controlled systems of supply, which cannot fail to have a far-reaching effect upon their commercial welfare. We must do the same unless we are content to take a back seat in the future.

The larger municipalities in this country, such as Glasgow, Manchester, Birmingham, Liverpool, Leeds, &c., have pointed the way—now it remains for Parliament to tackle the question of nationalisation; whether by means of a Government Department or a Public Board of Management, such as the Port of London Authority, or a private company, subject to limitations as to dividends and prices to be charged for current supplied, is yet to be seen.

Until some such scheme is brought into operation, it is useless to expect any marked reduction in the cost of producing and distributing electrical energy below that obtaining in the large power stations now operating in this country. It is only by tackling the problem boldly, by being prepared to supply current at prices much lower than are ruling at present, and recognising that for a few years there must necessarily be a deficit on the large initial expenditure incurred, that it will be possible to attract and develop the large volume of business that will be necessary to make such a scheme a financial success in the future. It will be as necessary to face expenditure in pioneering work for this scheme as it was in the early days of electric lighting, with this difference, however, that the returns to be expected should come very much sooner. If such a policy is ever decided upon, it must be strictly adhered to, and it should incorporate the following outlines.

Large bulk supply power stations should be installed in various parts of the country having regard to the three following chief requirements: (1) Proximity of an ample quantity of coal. (2) Proximity of an unlimited supply of water for condensing purposes. (3) Proximity of the various large centres of industry where the major portion of the energy is likely to be required.

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Railways, of course, cover practically the whole of the country, so that these can be fed economically at any point or points throughout their length.

As soon as these bulk supply stations are available and the distributing trunk cables installed, the majority of the small generating stations in the country should be at once shut down and utilised as sub-stations. It would probably be found most satisfactory in many cases to adhere to the existing methods of distribution, and to utilise these as far as they will serve, possibly, as they become filled up, installing alongside of them other schemes for distribution of energy which may prove more economical to handle.

And now a word about the engineers who are at present in charge of these isolated supply stations. It will probably be concluded that when all these stations are shut down the engineers in charge of them will not be required, and it is only human nature to resist the formation of such a scheme from the fear of being thrown out of employment. I consider that it would be the worst possible form of so-called economy to dispense with the services of a single man that is at present employed in all these undertakings. The very object of the scheme is to increase enormously the business to be handled in all these centres by giving the supply at a much more attractive price. The men on the spot have the best knowledge obtainable for pushing the business and developing the distribution of the bulk supply that they would receive, and the chief engineers in charge would be especially valuable in this direction. We electrical engineers have to be managers of our businesses as well as engineers in charge, and the business control is every bit as important as is the engineering control. The commercial side of the business is so dependent upon technical matters that it is necessary to have an engineer at the head. I do not see, therefore, that there need be any apprehension in the minds of the existing engineers in charge that they will not be required if such a scheme comes into being.

The main distribution should be carried out wherever possible by means of overhead trunk mains, and provision should be made for reasonable wayleaves to be compulsorily granted. Without special powers regulating the granting of wayleaves, it is probable that the cost of obtaining them would very nearly kill the saving of overhead trunk lines compared with underground cables. Another great advantage of the scheme would be that the cast-iron boundaries of existing municipalities and companies, which at present limit the various areas of supply, would entirely disappear.

London is now considering working out its own salvation on lines such as I have suggested, and it will be a great pity if the scheme that is finally adopted is not so laid out that it will be possible to work it in as part of a large national scheme such as I have indicated.

It is pretty evident that Parliament has its hands so full that there is not much hope, for the present at all events, of any move being made in this direction. I suggest, however, as this scheme is so vitally important to all industrial centres, that in their own interests the large municipalities, who at present control the major portion of the bulk supplies in the provinces, should meet together and discuss the matter, and, if possible, formulate a satisfactory scheme which could then be brought jointly before Parliament, to be subsequently developed on proper commercial lines.

In my opinion, this method of procedure is the most suitable one to adopt, and the justification for it is:

The supply of electrical energy for all purposes, whether industrial, domestic, or public utility, at a price far below what is now being paid:

- (a) For the benefit of the community as a whole.
- (b) For enabling our manufacturers to compete successfully with their rivals abroad, who, it must be remembered, are developing their resources on these very lines.
- (c) For the abolition of smoke in our large cities, and the consequent general improvement in the health of the community.
- (d) For the conservation of our coal supplies, which will be utilised on the most economical lines at present known to science, and

(e) For the upholding of our position as the leading country in the world of commerce, which position is being assailed more and more every year.

These reasons should surely be sufficient to make the controllers of our large industrial communities look carefully into the question of centralisation of the supply of electrical energy. [Prolonged applause.]

Previous to the reading of the Address a welcome was given to the members and visitors by the Lord Mayor of Birmingham, and after Mr. Chattock had sat down a very cordial vote of thanks was given him by acclamation on the motion of Alderman Bruce (Sunderland), seconded by Mr. H. Richardson (Dundee).

## NOTES ON THE COMMERCIAL DEVELOPMENT OF ELECTRICITY SUPPLY IN MODERATE-SIZED TOWNS

By W. A. VIGNOLES (*Chief Electrical Engineer, Grimsby*).

THIS Paper was taken after the reading of the Presidential Address. In it the author discussed problems to be met with in the supply of electricity in towns of about 100,000 inhabitants, based on his own experience in his own town, Grimsby, which has a population of about 77,000. Factories there are few in number, though there are the usual miscellaneous workshops incidental to a shipping town, and a few large sawmills. The latter, however, usually employ steam for power raising, burning their wood refuse instead of coal.

### Business-Getting.

Grimsby has no special powers for selling apparatus to consumers, and in such cases the author thinks that the establishment of a showroom is not worth while, as equivalent results can be obtained in other ways at less expense. For instance, the engineer in a town of about 100,000 inhabitants had stated recently that his showroom cost him £600 per annum, excluding canvassing staff; in Grimsby excellent results have been obtained by advertising with considerably less expenditure. In 1912-13, £268 was spent, and in 1913-14 £250. The increase in private consumers during the last year was 315, representing 17,714 lamps; motors increased by 316 h.p., the revenue from supply to private consumers by £2,144, and the heating and cooking connections by an equivalent of 3,411 8-c.p. lamps. The author then reviewed briefly the methods of advertising employed, and mentioned that the cost of £250 represented a very small proportion of the turnover, which was between £20,000 and £24,000. He referred to the activities of the British Commercial Gas Association, which is spending thousands of pounds on its publicity campaign, and suggested that the electric supply industry should combine to place the merits of electricity supply before the country in a forcible manner, as the Electric Supply Publicity Committee had not done much more outside London than supply leaflets and advertising literature. He suggested that the I.M.E.A. should appoint a Committee with full powers to confer with the Electricity Supply Publicity Committee or any other body, to endeavour to formulate some scheme by which a co-operative system of publicity could be put on foot for the benefit of electricity supply generally. Local authorities whose accounts are subject to Local Government Board audit, were hampered by a recent ruling that advertising literature may be purchased, but that authorities have no power to subscribe to the funds of an association organised on the lines of the Commercial Gas Association. A different constitution, he suggested, might get over the difficulty; if not, the sooner the I.M.E.A. Electricity Bill, in which there is a clause dealing with this question, was passed, the better. A further difficulty in the way of a large combined municipal scheme of advertising was that in a number of towns both electricity and gas are in the hands of the Corporation, but, he said, there did not appear to be any gas undertaking in the country that had seriously suffered from the competition of even the most energetic electricity supply authority.

Exhibitions and demonstrations were useful, especially when any new development came along; but the cost was heavy, and they should not be held too frequently.

Every undertaking of the size under consideration, Mr. Vignoles continued, should employ an engineer as canvasser or representative, devoting the whole of his time to this work. He should send through a daily list of his calls, and should report personally in any cases where he has difficulty in securing the business; in these cases the manager should visit the possible consumer, even if the installation in question is only a small one. Arrangements should be made with the borough surveyor to supply the department with the names of persons who have submitted building plans for approval, and to give particulars of any new roads or estates that are being laid out, and strenuous efforts should be made to induce the speculative and other builders to wire new houses.

The relations with wiring contractors was next discussed, and the author seemed to think that one of the difficulties was that the contractor often lost time and possible consumers by endeavouring to force his views on them, instead of giving the consumers what they wanted. In Grimsby also great trouble has also been experienced at times in getting contractors to follow up inquiries that have been obtained. To get over these difficulties the Department offers free advice

to all consumers, and for a small fee, 2½ per cent. on the value of the work with a minimum of 5s., undertakes the preparation of a specification, and superintends the carrying out of the work. Alternatively, any consumer can obtain free of charge an outline scheme for the lighting of his premises. The result has been a marked improvement in the methods of illumination in recent installations, and consumers are better satisfied. In the same way schemes are prepared for power users. A systematic method of dealing with complaints was also detailed.

When new devices or apparatus are placed on the market, the Department purchases a few examples and lets consumers have them on loan for trial. The consumers' engineer usually deals with these matters, and when the apparatus is on circuit looks after it until satisfaction is obtained, and endeavours finally to effect a sale through a contractor.

At Grimsby there is a friendly arrangement with the local contractors by which the Department hires out motors and starting apparatus, arc lamps, cookers and heaters, and provides installations and apparatus on hire purchase. All wiring work is done through a contractor, and no apparatus is hired out that is of less value than £3 10s. In many cases the Department takes over the hire purchase of apparatus or installations provided and arranged for by contractors, in which cases the profit is shared. On the other hand, although in the early stages of the development of the power load four-fifths of the motors were on hire, now by far the larger number of motors are purchased outright from contractors. One of the principal reasons for the rapid development at Norwich is that installations are provided if required on a rental basis, and undoubtedly all towns should be in a position to give this facility. But this can be given equally well by placing the actual work in the hands of a contractor, the Corporation merely doing the financing. It is advisable to combine the charge for the hire of the wiring with the fixed charge of the rateable value system, so that the consumer pays a fixed sum per annum, which includes the cost of the wiring of his premises and the capital charges for electricity supply, and the only additional payment he has to meet is the cost of current at the running rate of 1d., or ½d., per unit. No manager, said Mr. Vignoles in concluding this portion of his Paper, need sit down with folded hands and say, "I cannot adopt progressive methods to develop the business, because I have no powers to institute a sales department."

Dealing with the mains question, Mr. Vignoles advised undertakings not to exercise their right too freely of exacting a guarantee from new consumers outside the compulsory area to consume electricity to the value of 20 per cent. on the capital outlay involved in laying any new mains required. In new streets guarantees should certainly not be asked for, but mains laid as a matter of course before the houses are built; and broadly the principle might be stated to be that a guarantee should not be asked for unless there is a strong probability of the undertaking losing money by giving the supply, and it is felt that it would be better to be without the consumer. This question had been forcibly brought home to the writer by the fact that in the past a number of consumers had been lost by asking them for guarantees, and a few years afterwards mains had actually had to be laid down past the premises where supply had been wanted. In Grimsby a very large length of 7/16 three-core distributor has been laid and has given excellent results in providing for extensions in streets where there are numbers of small houses. The writer's present practice is to run one cable of this size in the first instance, and if additional consumers are obtained, to lay a 19/16 cable on the other side of the road.

The half-watt lamp then came in for mention. The present prosperous condition of electrical undertakings, said the author, is entirely founded, as far as the lighting branch is concerned, on the metal filament lamp. The only way in which the half-watt lamp could hurt undertakings would be if it was introduced in such sizes and at so low a price that it could be generally used for the smallest houses. If this came to pass, the question which is already agitating managers, as to how to ensure sufficient revenue from small houses to pay the capital charges on the cost of the service, in addition to the cost of current, would become more acute. Meantime, however, any decrease in units sold will be accompanied by a corresponding reduction in the maximum demand, and any loss of revenue will be made up by new business.

In Grimsby about 660 metal filament lamps are now in use for street lighting, and there is a very substantial margin of profit after providing for all capital charges on the mains, posts, lamps, &c., at the rate of 12 per cent. per annum, and charging the electricity used at 1d. per unit. All capital

expenditure for this purpose is provided out of revenue, so that the interest on the money is saved.

Returning to the small consumer problem, the author stated that in Grimsby supply is being given to consumers at present whose annual bill only just reaches 80s., while with slot meters many consumers are paying less than this. By standardisation and by adopting a system of looping services, running one cable for each pair of houses, the average cost per service has been steadily reduced from £3 19s. 10d. in 1906-7 to £2 17s. in 1912-13. With the smallest consumers and in premises where the tenant is likely to change frequently, it is very desirable to use slot meters; the revenue that has been obtained in Grimsby from these in the last few years has been as follows:—1911-12, £201; 1912-13, £270; 1913-14, £383. In order to keep in touch with the consumer the meters have been arranged for 5d. per unit, but when the meter is cleared 2d. in every 1s. is returned, so that the nett cost is about 4d. per unit instead of 3½d., the usual flat rate. Meter rents are not charged, so a small consumer pays no more on this system than he would on the ordinary rate. The system of refunding a proportion of the money put in is popular, as the meter in a way acts as a savings bank, and, in fact, it is strongly suspected that the "man" has to provide the 1s. while the lady of the house draws the rebate when the collector comes round.

Heating and cooking were referred to briefly in the Paper. In Grimsby with a 1d. rate, and without any appreciable number of heaters being let on hire, the sales for heating and cooking amounted to £324 last year. It is anticipated that with the proposed rateable value system, at 15 per cent. and ½d., a very large development will take place, especially as the various types of "heaters," notably the class using red-hot elements, are being rapidly improved. It is hoped to induce consumers to purchase their own apparatus, if not outright, at least on a short hire-purchase basis. With cooking the complaint is still that the apparatus is too expensive for the small householder to buy, while it is difficult to get consumers to pay 15s. per quarter for cooking apparatus when they can hire a gas cooker for 8s. 6d. Approval was given of Mr. Seabrook's experiment to charge 8s. 6d. per quarter rent, and to add ½d. per unit to the price of electricity used through cookers on hire, this ½d. being credited to the hire account. In order that the manufacturers may cheapen price by standardisation and greater output, Mr. Vignoles suggested that a number of undertakings should combine in adopting a particular make of cooker. While hesitating to recommend that the I.M.E.A. should appoint another Committee on this question, his own opinion is that the Association should have a number of permanent Sub-Committees, each dealing with and fostering the development of some particular branch of electricity supply.

To give the cooking business a start the author regards it as essential that one or more of the staff should actually use the cookers and study the art of cooking in a general way. A lady should afterwards be appointed to take special charge of this Department, and to advise consumers on the use of the apparatus.

### Financial Control.

Mr. Vignoles then put forward the view that the whole control of the undertaking, business-getting, engineering, and finance, should be under one supreme head; that the department should be entirely self-contained, the books kept, accounts collected, and balance sheet prepared by a staff supervised by an accountant under the control of the manager. He does not agree with a large part of this work being done in the Borough Treasurer's Department; many difficulties occur, because the clerical staff is not in close touch with the facts and details of the working of the undertaking. He has been informed by many managers that they have great difficulty in getting figures and statistics at the time, and in the form, in which they want them, and in one case it was actually proposed to get over the difficulty by keeping duplicates of a number of the books. Where the Borough Treasurer controls the finances, Mr. Vignoles contends, he naturally exercises a considerable influence in the financial management, and is frequently more interested in devising means for keeping down the rates than in seeing that the financial position of the undertaking is unassailable.

As an example of the mistake of contributing profits to the rates, the Author cited one instance in which the Council in one year voted the whole of the profits for the following year, estimated at £9,000, to the rates, notwithstanding the fact that they had a whole engine-room full of obsolete plant. The surplus only amounted to £7,000; not to be beaten, the Council in the next year voted £6,000 to the rates, to find that the surplus was £4,000 only. He believes in devoting the larger portion, if not all the profits (after paying back to the rates any sums taken for the undertaking) to the strengthening of reserves, and to the reduction of the price of electricity to as



low a figure as possible, and he approves of Mr. Pearce's suggestion that a limit should be placed by Parliament on the contributions to be made to the rates. This policy, while being the soundest from the point of view of the financial stability of the undertaking, would, in practically all cases, be the best for the district. A cheap supply of electricity brings prosperity to many towns by encouraging the use of machinery and causing new industries to be established.

The Paper next dealt with the raising and repayment of capital. When capital is raised by the issue of stock, the Author is in favour of investing the sinking fund in the undertaking, using the money to purchase new machinery instead of raising further capital. It is, he says, open to any Corporation to do this, under the Local Government Board Stock Regulations of 1901 and 1902, amending those of 1891 and 1897. All these regulations are issued under the provisions of the Public Health Act of 1890. He mentions, however, that the simplest method of raising money for electricity supply purposes is by the borrowing from companies, societies, or individuals, on the security of the district rate, and to repay the loan by way of annuity—an equated payment of principal and interest, calculated so that while the interest is large the repayment is small, making the burden on each year's working equal.

The Grimsby Corporation have never taken up a loan for their electricity undertaking for any period of less than fifteen years. The Local Government Board has approved the borrowing of money for certain purposes with the term of repayment fixed at five and ten years, but in these cases the money has been taken out of the profits of the undertaking. This has saved expenses in negotiating the loan and interest. In this way the undertaking provides for all new meters, public lamps, and posts, while it also provides in the same way for small extensions of mains and for the wages paid to men in permanent employ when working on capital account.

On the question of temporary loans, the Author referred to a note in the Press some time back stating that the St. Marylebone undertaking were borrowing £10,000 from the St. Marylebone Borough General Fund account at 2½ per cent. interest, this being the rate which the General Fund would have received from the bank.

As to the provision for depreciation, Mr. Vignoles stated the following principle:—Depreciation must be provided so that the value of the assets at any time at least equals the capital outstanding, i.e., the total capital raised, less the amounts repaid, or providing for repayment, and less the depreciation, reserve, and sinking funds. To value assets the original cost must be written down on the basis of the estimated number of years of life, and in addition an allowance must be made for possible obsolescence by the introduction of new and more efficient apparatus before the expiration of that period.

The following are the loan periods sanctioned by the Local Government Board in recent cases:—Land, 50 years; foundations, 30 years; buildings, 30 years; Water-tube boilers, 15 years; generators, 18 years; conveyors, 15 years; engines and other machinery, 18 years; turbines, 18 years; cables (solid, in wood trough), 25 years; cables (ducts), 25 years; services (either armoured or laid solid), 15 years; rotary converters and motor generators, 15 years; accumulators, 10 years; arc and incandescent lamps and posts, 10 years; meters, 5 years; switchgear instruments, 18 years; water recorders, 15 years; cooling towers, 10 years.

A reserve fund acts as a protection to the capital account, but it must be borne in mind that it may be called upon at any time to provide for a deficit in the revenue account, any amount so transferred ceases to be available for depreciation, as it has passed out of the capital account. In providing depreciation, therefore, a margin should be allowed, over and above the calculated amount required, to provide for such a contingency.

With these short periods the author thinks that there is every probability that nothing further is required in the way of depreciation, and that the machinery will, in most cases, be in efficient use after the whole of the loan has been repaid. Most undertakings, however, have obsolescent machinery in use on which loans are still outstanding, and in one case a large number of engines were out of date before business had developed sufficiently to provide load for all the sets. In the Grimsby accounts there is no depreciation fund so-called, but this is represented by the repayments of loans, the revenue contributions to capital outlay, the reserve fund, and the sinking fund.

Mr. Vignoles thinks it probable that the Local Government Board would give permission to the borrowing of the whole amount required for new plant to replace obsolete, if sufficient depreciation had been provided and ear-marked in the accounts to meet the whole amount outstanding on the plant to be scrapped, even if such depreciation had already been invested in the undertaking in the form of new assets.

In Grimsby the difficulty of having working capital is got over by not investing the reserve fund, but leaving it in the ordinary banking account. The Local Government Board recently reminded the Corporation that, under the Electric Lighting Acts, this money should be invested, but it was pointed out in reply that if this were done the only alternative would be to borrow money from the bank, and that the Corporation

had no powers to do this; also, that the course which they had adopted was more economical, as the reserve fund if invested would only have earned about 3½ per cent., whereas the bank would have charged 5 per cent. for the overdraft. The necessity for working capital was also pointed out to them, and the Board have not raised any further objections.

The following table given in the Paper is interesting:—

Year ending	Grimsby.		Ipswich.		Norwich.		Southampton.	
	1907	1911	1908	1911	1907	1911	1908	1911
No. of Consumers per mile of distributor	31.5	44.4	31	52.2	101	92	50*	59*
Total Revenue per mile	£ 568	£ 550	£ 744	£ 930	£ 808	£ 793	£ 1,513*	£ 1,061*
Revenue per Consumer	£ 18.1	£ 9.0	£ 24.2	£ 15.3	£ 8.15	£ 8.5	£ 30.4	£ 18.1
Revenue per £ Capital spent on Mains and Services (exclusive Public Lighting)	0.611	0.83	0.120	0.127	0.710	0.85	0.92	0.98
Average Cost per Service	3.19.10	2.17.0	4.2.1	3.8.5	4.0.0	3.5.0	3.4.3	3.19.5

\* Per route mile in the case of Southampton.

### Cost of Supply.

Many progressive managers advocate the principle of selling electricity not on the basis of cost but on what it will fetch in the market; but the Author is of opinion that this should not be done if it involves selling below what it costs unless:—(1) It can be shown that selling at the proposed price will so reduce costs that ultimately a profit will be made; or (2) that by selling at a loss other business, which would not otherwise be done, can be obtained upon which the losses can be made up. This is not a suggestion that the "Point Fives" are selling at too low a price; if electricity is being sold at a loss, the Author says, it will probably be to the short-hour consumers who are paying on a flat rate, such as banks, offices closing at five, and early closing shops. At a flat rate of 3½d., the price in Grimsby, he says, they almost certainly cause a loss to the undertaking at the present time.

Mr. Vignoles has worked out that the average cost of generation, as long as the conditions remain the same, follows a definite law, which is similar in form to the Willans law for the steam consumption of an engine. The total cost of generation per annum (not the cost per unit) is equal to a fixed sum, plus a small running cost per unit sold. This is illustrated in

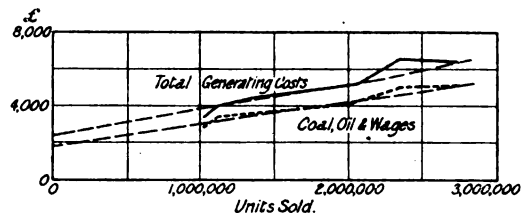


FIG. 1.—GRIMSBY GENERATING COSTS.

Fig. 1, which shows for Grimsby the amounts spent on generation during the years 1905 to 1911.

Fig. 2 shows coal, oil, and wages plotted for four towns. A straight line (see Fig. 1), is drawn fairly easily through the points plotted for coal, oil, and wages, the coal cost having been adjusted to a uniform price of 7s. 5d. per ton for ½-inch slack, this being the highest price during the period. The equation for this straight line is that the standing charges are £1,750, while the running cost, i.e., the extra cost for oil, wages, and coal, is 0.313d. per unit. In spite of the varying cost of repairs each year, the upper line lies fairly among the points; the formula for this is £2,450 plus 0.341d. per unit. The cost of generating the supply required by any consumer will be 0.341d. plus a proportion of the standing charges of £2,450, based on his maximum demand. In certain cases, where new classes of business are being considered, the Author thinks it may be advisable to ignore the standing charges, as these are being met by the revenue received from existing supplies. This is the attitude adopted by the "Point Fives," and it is a reasonable one provided that their charge covers the extra or running cost of supplying the extra units, any extra capital charges involved, and leaves a margin of profit for the benefit of the undertaking.

The division of the generating expenses into standing charges and running costs was advocated by the "Joint Committee of the I.M.E.A. and M.T.A. on charges for electrical energy for traction purposes from combined stations," and they gave a method of calculation. Applying their method to the Grimsby accounts for the year 1912-13, two years later than the last point marked on the curve in Fig. 1, gives the division as:—Standing costs, £2,394; and running costs, 0.36d., figures sufficiently near to those proved to be correct by the straight line in diagram Fig. 1.

The management expenses can be divided into two principal items: running the undertaking, and development work in seeking and providing for new business. In the case of the Grimsby undertaking, fully one-third of the management should

be debited to the latter as it includes the engineering charges for all new extensions, with the exception of any special draughtsman's work. In allocating the management costs, the expense due to the running should be debited to the various classes of supply in proportion to the maximum demands, while it is suggested that the development expenses should be allocated in proportion to the profit made. That is, that it should be taken out of profits, and not shown as an expense against any particular class of supply.

The capital charges must also be allotted according to the maximum demand on the plant.

Working out an example of the cost of bulk supply or that for cooking at Grimsby on this basis, the author made the net extra cost under present conditions, with coal at the highest price it has reached in the last five years, to be £2 11s. per kw. of

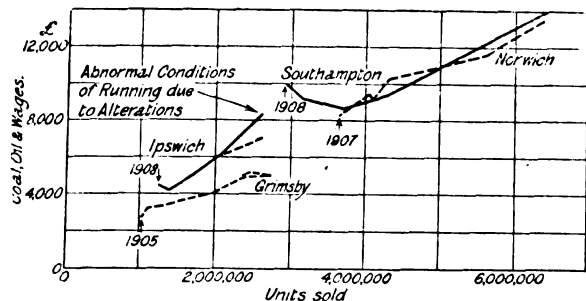


FIG. 2.

increase in the peak on the basis of new plant, or £3 18s. if the average cost of the present plant be included, with an extra of 0.34d. to 0.36d. per unit sold.

At Southampton, in 1913, the load factor including all units sold was 22.23, and excluding units sold for cooking 19.35, which points to the effect of the cooking load on the peak being small.

From the figures given, Mr. Vignoles concludes that electricity can be sold for cooking under the conditions at Grimsby on a rateable value system of 15 per cent. and ½d. at a substantial profit.

A note at the end of the Paper touched on the question of turbine generating sets of 1,000 kw. and upwards which are now becoming desirable to bring down the generation costs in towns of moderate size. With such units it will be necessary to use alternate-current generators or geared turbines, and in several cases the former have been installed in continuous-current stations, a rotary converter being also erected in the station to make the conversion. The Author suggests that it would be better then to take advantage of high pressure to reduce the capital cost of the feeders, and at the same time to arrange to supply a few large consumers with high-tension three-phase current giving a slight advantage in the price. The change from D.C. to three-phase, he thinks, is being forced by the changing conditions.

The Discussion on this Paper is reported on p. 347.

## DESIGN AND OPERATION OF MODERN BOILER-HOUSE PLANT

By S. E. FEDDEN (*Chief Electrical Engineer, Sheffield.*)

YESTERDAY the members proceeded to Coventry, and the meeting was devoted to Mr. Fedden's Paper with the above title.

Ample facilities for dealing with ashes, said Mr. Fedden, is becoming a very serious source of expense and concern in large cities, because of the difficulty of obtaining tips within a reasonable distance of the station. In Sheffield the cost of carting has increased no less than 40 per cent. within the last few years. This increased expense, he continued, can appreciably increase the cost per unit, and it may be necessary to take into consideration whether it is not worth while to buy a high-priced coal with, say, 4 or 5 per cent. of ash, instead of the cheaper class of engine slack with its 10 to 15 per cent. of ash.

The author has lately gone to considerable expenditure to deal with ashes. A lease of a valley adjacent to the power house has been obtained, and a steel bridge erected for guard purposes over the main line of the railway. A ropeway 200 yds. long has been installed, capable of dealing with 20 tons of ashes per hour. This method of dealing with the ashes was arrived at after investigating the undermentioned alternative schemes, which worked out as follows:—Railway, 2s. 9½d. per ton; cartage, 1s. 11d. per ton; ropeway, 1s. 3d. per ton. [The aerial ropeway is described in detail later in the Paper.]

Dealing next with the facilities for getting in coal, Mr.

Fedden considered it advantageous to choose a site having a high level siding, so that the trucks come in straight off the railway over the top of the bunkers, thereby doing away with the expense of installing and running coal conveyors. It costs much less to elevate the 5 per cent. to 10 per cent. of ashes than to handle the full quantity of coal, in addition to the probability of having to lift the ashes again. Neepsend power-house is arranged on this plan, and the problem looked rather a formidable one, as the author had to cut sheer down 60 ft. and excavate approximately 30,000 cub. yds. of material. Trial holes, however, had been taken before deciding to utilise the site, and it was found that the material was suitable for brick making. The author, therefore, bought a few thousand bricks and built three Newcastle case kilns, which were used for providing bricks for building a permanent kiln and chimney. A large portion of the material was found suitable, and was converted into bricks for the power-house, other portions of the excavations were found to be good hard rock, suitable for concrete and wall building, and the foundations were excellent. The expensive-looking site, therefore, turned out to be a cheap one as regards capital cost. The capital cost per kw. for the first section of the station is below £10, including the cost of land and sidings.

From the drawing on p. 344, which also shows the ground provided for tipping ashes, it will be seen that although the turbines are widely spaced, the boilers have to be cramped, in order to obtain the necessary amount of steam. The original plan of boilers in line with the engine-room had to be amended, and the boilers placed in a transept running out of the original boiler-house.

The present equipment of the boiler house consists of eleven water-tube boilers of the following capacities.

	Nos. 1 to 4.	Nos. 5 to 8.	Nos. 9 to 11.
Heating surface ...	6,210 sq. ft.	8,016 sq. ft.	9,611 sq. ft.
Grate area ...	80 sq. ft.	144 sq. ft.	192 sq. ft.
Normal evaporation of water per hour ...	50,000 lbs.	35,000 lbs.	48,000 lbs.
Steam drums ...	3 of 3' 6" diam.	3 of 4' 0" diam.	3 of 4' 0" diam.
Mud drums ...	2 of 3' 0" diam.	2 of 3' 0" diam.	2 of 3' 0" diam.
No. of Tubes ...	432	540	648
Stokers ...	Bennis.	Chain grate & Underfeed.	Chain grate.

Three more boilers are under construction for next winter's load.

The boiler house is provided with two pump rooms. No. 1 contains four feed pumps of the long stroke vertical compound double-acting type, three having a capacity of 3,000, and the fourth 10,000 gals. per hr.; also three live steam feed water heaters, capable of raising the temperature from 85° to 135° F.

No. 2 contains four feed pumps of a similar type, with a capacity of 10,000 gals. each per hr.; one rotary feed pump, motor driven, with a capacity of 20,000 gals. per hr.; one motor-driven centrifugal pump, with a capacity of 10,000 gals. per hr.; five live steam feed water heaters.

The duties of the last-mentioned pump are of a three-fold nature:—(1) In the event of the town water supply being cut off, water can be pumped from the river direct to the overhead feed tank. (2) It can be connected to the existing water service mains where the town supply is not available to provide a supply of water for fire purposes. (3) Economy is effected by using the river water in place of town water for cleaning out the boilers.

An overhead tank is fixed above each pump room; the capacities are 20,000 and 25,000 gals. respectively. The exhaust steam from each steam feed pump is led to the overhead feed water tank, the exhaust pipe having a silencer fitted. It is, however, essential that great care should be exercised to prevent oil getting into the economisers and boilers.

The whole of the steam piping is wrought steel lap welded, with cast steel tee pieces. The valves and bye-passes are also of cast steel suitable for use with superheated steam. The steam pipe is 10" and 12" diameter single main, and runs the whole length of the boiler house. The turbines and boilers are connected to the main steam pipe by single connections, and the steam of the feed pumps only having a ring main. The water mains are of cast iron 6" diameter with flanges bracketed.

There are two main feed pipes, hot and cold, running the whole length of the boiler house, and these mains are inter-connected by valves so that if a fracture occurs either main can be put into commission. Further, the pipes are arranged in standard lengths as far as possible, so that a fractured pipe can be readily replaced. Expansion pipes are provided by means of copper bends in both mains, and there are copper bends in each branch connection to the boilers and economisers. The steam and feed water mains are carried on roller supports when ever possible, and sling supports in other positions.

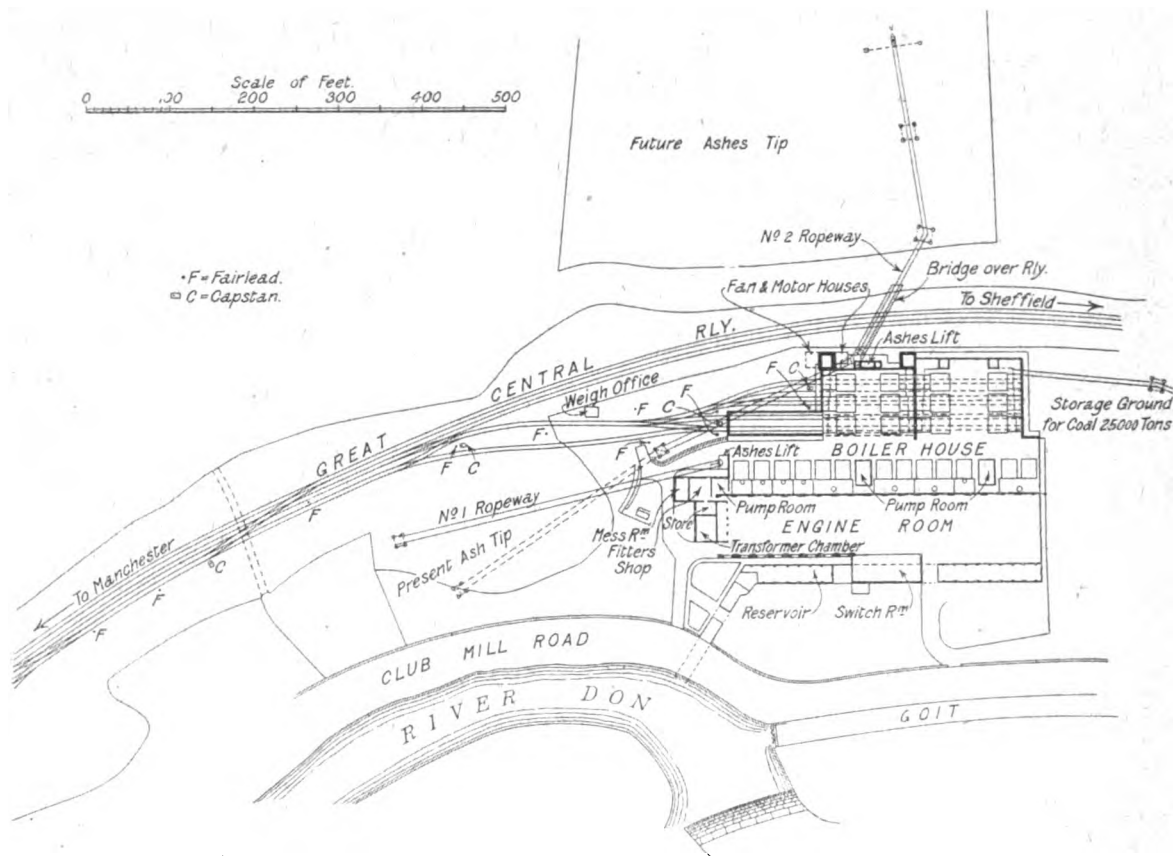
Provision is made for a three weeks supply of coal opposite each boiler on the siding level, and each boiler has a shoot

holding about 100 tons of coal, which feeds by gravity into the mechanical stoker hopper. At the top of these shoots, and, in fact, between all the railway lines over the bunkers, is provided a steel grid to prevent any large lumps getting through. Bottom-emptying trucks are brought directly over these shoots, and, with the exception of trimming from the extreme corners of the trucks, the major portion of the coal is never handled from the time of putting it in the trucks at the colliery until it is taken hold of by the mechanical stokers.

At the ends of the five railway lines over the top of the bunkers a traverser is provided for the transference of the railway trucks from one line to the other. It has a working capacity of eighteen tons gross, and is electrically driven by means of an 8 h.p. two-phase motor running at 700 r.p.m. on a 200-v. 50-period circuit.

The shoots are fitted with measuring chambers and indicating gear, and the coal is led through breeches pieces to the stoker hoppers. It is frequently claimed that measuring chambers are most inaccurate, but the author contends that this is not so. All the coal in stock is levelled off every month, and surveys by three men from different departments are taken independently. The difference between the stock as shown in the stock book

At Neepsend the ashes are elevated to an overhead hopper and taken away to the tip ground already mentioned by a bucket ropeway. This automatically tips the ashes wherever required, whilst the empty carriers proceed onward without stopping or being handled in any way, and are automatically conveyed around a return terminal back again to the loading terminal, where they are automatically disengaged from the hauling rope, and then stand ready for loading again. The loading rail is at a height of 17 ft. above ground level. The ashes are collected in the basement underneath the boilers in ordinary tipping wagons, running on a 2 ft. gauge tramway. The wagons are then run to an electric hoist just outside the boiler house, and raised 40 ft. above the basement level, where their contents are tipped into a hopper of 54 cu. ft. capacity. From this hopper the ashes fall through a shoot, controlled by a hand lever, into the boxes of the ropeway carriers standing on the loading rail. The automatic return terminal of the aerial ropeway is mounted on eight steel wheels running on a pair of rails, so that as the ground around is filled up in course of time by the tipping, the terminal itself can be moved along. In this way it will be seen that the whole installation can be moved round fanwise for a total length of 190 feet, so that in time the whole of the low ground to the



GENERAL PLAN OF NEEPSEND ELECTRICITY WORKS.

obtained by means of the measures and indicators and that obtained by the independent surveys is not very great: Stock, 6,527 tons; No. 1 Man, 6,426 tons; No. 2 Man, 6,461 tons; No. 3 Man, 6,582 tons.

The next important item in regard to a boiler house is the water supply. If good water is not available it should be treated at any reasonable cost before it goes into the economiser or boiler, and if it is very cold, say below 80° F., the temperature should be increased to 110° F., even though live steam feed water heaters are installed to effect this. The author will not admit that warming water by live steam is economical and saves coal, but he concedes that any loss incurred by heating the feed water by live steam is well and amply repaid in the saving of repairs to the economiser and boiler tubes.

The live steam feed water heaters which the author has had in use satisfactorily for some years have been those fitted with a patent indented tube. This is made by taking a plain round tube and indenting it in a regular manner at right angles, so that fluid passing through the tube is thoroughly broken up and diverted into contact with a large amount of impinging surface.

The ash disposal arrangements, in the author's opinion, should be such that the ashes can be lifted from two or three points in the ashes trench; and whether rails, trucks, elevator or suction plant be employed, it is well not to be absolutely dependent on any one of these, but openings should be left in the boiler-house floor covered with plates, so that the ashes can in an emergency be taken away by carts driven into the boiler house firing level or underneath if the lay-out will allow.

left of the ropeway will be automatically filled up. The whole installation, including the loading and despatch of the carriers, is worked by one man. An additional shoot has been connected to the hopper so that in the event of a breakdown of the ropeway a railway truck can be run under this shoot to give an alternative means of getting rid of the ashes.

A suction plant is about to be put in for all new boilers, and eventually for the old ones, by which the author expects to save considerable labour, and also to do away with much dirt and dust, besides causing the atmosphere in the ashes trench to be less vitiated by the fumes, and to clean soot from soot chambers and economisers, thus reducing the amount of manual labour. The system of suction plant has been fully described within the last year or two [see *ELECTRICAL ENGINEERING*, July 25th, 1912, Vol. VIII., p. 421], and the author feels that there is no need for a further description. However, manufacturers' opinions seem to differ very considerably as to the means of conveying the ashes and gritty matter by pipes to the receiving chamber. Some recommend a blower of the Roots type, while others recommend a continuous suction by means of a motor-driven fan. A similar difference of opinion appears to exist as to the advisability of introducing a screening plant into the suction circuit so as to exclude the fine particles of dust from the veins or slides, which would be quickly scored away.

As to the type of boiler to be used, Mr. Fedden expressed

the view that circumstances force careful engineers to use practically one of five or six types in this country, and "of course these are of the water-tube type, Lancashire or marine boilers being totally unsuitable for obtaining the large amount of steam required on the small area available in a modern power-station." There is very little to choose between these five or six types, continued Mr. Fedden; they all want good water, one claims a little better efficiency, the other claims less maintenance. He thinks that from experience the boilers made in this country are of first-class design and workmanship, and with due care the cost of maintenance should not be heavy. He is in favour of the vertical tube boiler, having experienced very good results from this type, but other engineers have no doubt obtained equally good results from the horizontal tubed boilers. To get the maximum evaporation out of the smallest floor space means a large grate area and the burning of as much coal as possible per sq. ft. There is, of course, an economic limit to this high rate of combustion, both as regards efficiency and maintenance, but it is very comforting to feel that boilers can be pushed to 40 or 50 per cent. above their normal working load in case of emergency. In the event of a very high rate of combustion becoming general and proving itself satisfactory, there will have to be a re-designing of the boiler combination by the adoption of larger economisers, superheaters, flues, feed-pipes, steam-pipes, fans, coal bunkers, and ash-disposal arrangements.

If land is scarce, an economiser raised above the outlet damper of the boiler has much to recommend it, as, of course, there is then no check to the natural flow of the gases. As an offset to this, however, additional expenditure is incurred in steelwork to support the economiser, and also in the building of a high boiler-house, and it may cause a considerable reduction in the capacity of the overhead coal bunkers.

The author considers with his present knowledge that the best overall efficiency and least maintenance cost is obtained by running the following combination:—

Water-tube boilers, economiser, chain-grate stokers, induced fan draughts. At 25 lb. of coal (rough engine slack) per sq. ft. grate area: Evaporation per sq. ft. of heating surface, 5.25 lb.; in-going gases to economiser, 450° F.; out-going gases from economiser, 300° F.; though it is quite possible to burn the same class of coal up to 30 lb. per sq. ft. of grate area with good economy.

The author has noticed that manufacturers have put forward for different capacities similar sizes of boilers, but with stokers having a larger grate area, so that some standard as to rating should be adopted. The standard adopted by the electric supply department at Sheffield is that the normal evaporation should be obtained by burning 25 lb. per sq. ft. of grate area with a chain grate stoker burning engine slack.

The author has lately installed some 8 ft. Class E. underfeed stokers to two water-tube boilers fitted with both forced and induced draught. The boilers were specified to evaporate 35,000 lb. of steam each from and at 212° F. The induced-draught fan h.p. on load is 55, giving 1.3" draught, and the forced-draught fan h.p. on load 80, giving 2" draught. Normal coal per sq. ft. of grate area is 33.5 lb. Evaporation per sq. ft. of heating surface is 5.25. The temperature of the in-going gases to the economiser is 518° F., and of the out-going gases 290° F. The results are:—Burning up to 47 lb. of coal per sq. ft. of grate area under the above working conditions the boiler evaporated 58,000 lb. of water per hour from and at 212° F., but the heat of the brickwork was so intense after the first hour's run that the rate of burning was reduced to 38 lb. per sq. ft. of grate area. The superheater was not designed to deal with this large amount of steam, the temperature being reduced from 150 under normal conditions to 110° F. The author thinks that this combination has a great future before it, and its limit will be determined by the ability of the brickwork, &c., to withstand the intense heat generated in the furnace with the above conditions.

There are many claims that the natural draught system is the right and most economical one, but it lacks flexibility, and makes it so dependent on atmospheric conditions, good coal, &c., and many instances are recorded where generating stations have been started with high brick chimneys, where at a later date fans have had to be added to secure the necessary flexibility and draught. The author is a believer in mechanical induced draught, and strongly advocates that care should be exercised to instal a fan or fans capable of dealing with the worst atmospheric conditions, and of dealing with sufficient gases for the maximum possible overload of the plant. Regarding the hot *versus* cold air systems of induced draught, it would appear that the latter should be the more economical, owing to the smaller power said to

be required to deal with the lesser volume. The author investigated this matter some three or four years ago, but could not satisfy himself that there was any very great benefit to be derived, besides which the cold air injector was expensive to manufacture and renew.

A decision with regard to the type of mechanical stokers is difficult to arrive at. The ideal stoker should be able to deal with clean nuts or smudge, should be able to get to full duty from banked fires in the shortest possible time, should be capable of doing 50 per cent. above its normal duty for short periods in case of emergency, should consume all combustible matter fed on it with the most efficient percentage of CO<sub>2</sub>, should be smokeless under all conditions, besides which it must be strongly built, reliable, and easy of access for the repair of the working parts or the renewal of the bars. These conditions are, of course, difficult of attainment in one stoker. For small grates there are many good and reliable stokers on the market in Britain, but with the larger grates now required the choice is focussed down to two or three. The chain grate has in the past done yeoman work, but it has its weak points, such as the difficulty of burning mixed slack and the difficulty of keeping an even covered grate, the prevention of unburnt coal being dumped, the extra labour in handling riddlings which filter through the grate before coking takes place, and it is unable to comply with many of the requirements set out above. However, when the improvements now being carried out on it are perfected, no doubt it will come much nearer to the ideal. The underfeed stoker, which has recently been enlarged and strengthened in its mechanical parts, has proved itself, from the author's experience during the last eighteen months, most satisfactory, and complies more nearly with the conditions before-mentioned.

The author therefore considers that the safest arrangement for a large boiler-house is to instal a certain proportion of the old reliable chain grate, which has proved satisfactory over a long series of years, and the remaining portion of the newer type, which, while being excellent from results obtained in a comparatively short time, has yet to prove its superiority over a longer period.

At the present time at Neepsend there are 3,000 tons of coal immediately over the boilers and 5,000 tons on the coal-storage ground. The method of storing coal depends on the quality. The author has experimented with various qualities and finds that rough slack obtained in the Yorkshire district and stored in large quantities is subject to spontaneous combustion. Consequently, nothing but screened nuts are now being laid down and stored in 500 ton lots. The heaps are ventilated and temperatures taken regularly. In this way it is anticipated that the coal may be left in the open for a period of years, and that the loss of calorific value will be only 10 to 15 per cent. The capital expenditure entailed in handling works out at approximately 15s. per ton of coal stored to about 6 ft. high. If, however, a better class of fuel be purchased, and the height increased, the cost will be proportionately less. This 15s. includes the provision of a complete scheme for delivering the coal from the wagons on to the storage ground and back again into the coal bunkers over the boiler.

Another system of storing coal where spare ground space is limited is to erect a silo and instal the Clayton or some similar system for extinguishing fire.

The following is a copy of the weekly costs sheet used in Sheffield, the figures being the actual ones for the week named:—

Particulars	Neepsend (32,000)	Sheaf Street (31,170)	Continued Stations (16,600)
Units generated			
Coal—Neepsend	104	11	23
Sheaf Street	77	3	12
Others	211	10	11
Water—Neepsend	24	3	5
Sheaf Street	125	1	1
Oil Waste and stores	4	4	1
Salvage and stocks	70	20	100
Engine Room Equipment	21	1	1
Boiler House Equipment	1	1	1
Buildings	1	1	1
Services	1	1	1
Lighting and Power	1	1	1
Total Works Costs	415	85	51
Maximum demand	8,111	1,611	9,917
Load Factor	35.5	14.26	33.5
Current used on Works	21,527	8,111	24,314

With regard to the suggestion made from time to time lately that large electric power-stations should be equipped



with by-product plants, it will, of course, be necessary to bear in mind that if such plants were installed for distilling the coal and making gas either for burning under the boilers or for driving a gas engine, the capital expenditure per kilowatt of plant installed would have to be considerably higher than it is at present, in an ordinary coal-fired steam turbine station. In looking through his present load curves, the author estimates that for 2,000 kw. of plant installed out of a total of 25,000 kw., it might be economical to provide by-product plant. This is about 8 per cent. of the total plant of a power-house, and this plant should be run at practically 80 per cent. load factor to make it a paying proposition. If a by-product plant were attached to a power-station, a much larger area would be required.

The problem of high superheat is looming in the not very distant future, and engineers and manufacturers will have to face a new set of conditions when a dull red gas is being passed through the steam-pipes and valves.

Finally, the author wishes to impress on all the great importance of a present-day boiler-house and plant; it is, in fact, of paramount importance, where more money can be saved than anywhere else in a power-station, to employ and pay highly-trained and capable men who can bring scientific knowledge to bear on the many important problems that present themselves for investigation. The Krieger car, equipped with a Naylor battery, also arrived from London by road.

### THE ELECTRIC VEHICLE PARADE

A DESCRIPTION of the cars taking part in the Electric Vehicle Parade appeared in our last issue, with illustrations of some of the cars. The four Edison cars came down by road, as did also a Stevens-Tilling petrol-electric car, towing one of the firm's new all-electric cars which was just got ready in time to send down in this manner. The latter is built on the same chassis as the petrol-electric type, a Tudor battery covered by a Renault type bonnet taking the place of the petrol engine and dynamo. It has a carrying capacity of from 3 to 4 tons.

### THE G.E.C. WORKS.

IN connection with the visit of the I.M.E.A. to the works of the General Electric Co. the opportunity was given by the Company to a large number of members of the Press to make a preliminary inspection of the works on Monday, and an extensive and interesting tour was made of the various factories at Witton and Edgbaston. In addition to the Engineering Works, the Fan Works, the Switchgear and Arc-Lamp Works, the Central Stores, and the Conduit Works, all of which were fully described in our last issue, the Carbon Works, which is the only factory in the United Kingdom at which arc-lamp carbons are manufactured, was open to inspection. The manufacture, which has required a large amount of experimenting to bring it to its present state of perfection, comprises about twenty-five separate processes. The raw material is obtained by the imperfect combustion of oil-fuel in a furnace. The vapour is cooled, and the deposited carbon is conveyed to rotary mixers, where it is moistened and reduced to a homogeneous semi-solid state. It is now pressed into blocks and fed into a forcing machine. From here it is forced out through a small circular opening of the same diameter as the finished carbons, and passes along a smooth table and under a revolving wheel which cuts it into lengths of about 5 ft. These lengths are then packed into cylindrical earthenware holders and placed in the baking ovens. The first of these is worked at a moderate temperature, so that the carbons are heated gradually and evenly. After being in this oven for some time the holders are transferred to the next oven, which has a slightly higher temperature, and afterwards to an oven with a still higher temperature, and so on until the highest temperature is reached. The process is then reversed, and the holders are gradually moved back to the first oven. The rods, which are now quite hard, are cut up into the requisite lengths, and are passed through an ingenious machine which sorts out any which are not of the correct dimensions. Another machine then points one end of each carbon. In the case of cored carbons, a central hole is left in the rods as they come out of the forcing machine. The soft core is now forced into place, and in a short time sets hard, and the carbon is ready for use. For certain classes of work, such as cinematography, the carbons are made with a copper core and an outer coating of copper. Both of these are electrolytically deposited, their object being to allow high-current densities to be used without undue heating of the carbons.

Luncheon, which was served at the Grand Hotel, Birmingham, was presided over by Mr. H. Hirst, the Chairman of the Company, who afterwards, in a short speech, deplored the present-day tendency to municipalise electrical undertakings. He also stated that the Company had absolutely no connection with any other firm, either in America or Germany, bearing the same name.

A visit to the Ilene Works at Edgbaston, which were also dealt with in our last issue, completed the interesting tour of inspection.

### THE ANNUAL DINNER

AT the Annual Dinner on Tuesday night an interesting speech was made by Dr. S. Z. de Ferranti in proposing the toast of the evening. He made a reference to the dissolution of the Industrial Committee of the Institution of Electrical Engineers, which indicated that the policy of the Institution Council in this matter was a subject of sincere regret to him. He referred to it as a "sad failure," he regretted that even personal friends of his on the Council held "views which he heartily detested," and hoped that it was still not too late to see a change of policy. Although he spoke guardedly, carefully choosing his words, it was clear that in referring to the I.M.E.A. as being conducted on right lines by its Council in doing its utmost in every direction conducive to the best interests of its members, he contrasted its policy in this respect with the older Institution, and left it to be inferred that it rested with the membership of the latter body to see that their views should prevail with its Council. Dr. Ferranti also referred to the portion of Mr. Chattock's Presidential Address relating to what he termed the nationalisation of electricity supply, and said that before the Chairman's ideals could be realised, a 25 per cent. efficiency in the conversion of the energy in fuel to electrical energy would be necessary, large improvements in the efficiency of transmission, and a lessening of the capital cost of transmission lines.

Mr. Chattock, in the course of his reply, asked members, at the Annual General Meeting to-morrow, to raise points on the discussion of the Annual Report, and to let the Council hear their views.

Interesting particulars of the progress of the Birmingham electricity department were made by Mr. J. F. C. Snell in proposing the toast of the "Electric Supply Committee of Birmingham," and by Councillor Ellaway, Chairman of the Committee, in his reply. The maximum possible output of the original Birmingham electricity works in Dale End had been one million units per annum. Now the output of the Summer Lane works is between 60 and 70 million units per annum, and a large station is being planned at Nechells, a suburb of Birmingham, with a capacity of 100,000 kw. and units of from 5,000 to 10,000 kw. capacity.

### DISCUSSIONS ON THE PAPERS

#### Commercial Development of Electricity Supply

MR. W. A. VIGNOLES read a short and excellent summary of his paper, in which he emphasised the importance of a corporation obtaining hiring and hire-purchase powers. In fact, he went further than he did in the paper itself, for he recommended that, if the dropping of the wiring and selling powers would facilitate the passage of the I.M.E.A. Bill, so that the hire and hire-purchase powers might be obtained, this should be done.

Mr. F. AYTON (Chief Electrical Engineer, Ipswich), who opened the discussion, said that at Ipswich they had been advertising ever since the inception of the undertaking ten years ago, and had come to the conclusion that any publicity work must not be of a spasmodic nature. The results from advertising were distinctly traceable and extremely good, but the effect noticed during the first year or two was small, and it was necessary to advertise steadily and continuously. One of the most valuable media he had found to be advertisements on trams, and one which had brought in best results read as follows: "Sunlight on tap is electric light. It makes the home more cheerful." He was in favour of short statements such as this, and adopted the mail card form of advertising in preference to pamphlets. His experience at Ipswich showed that it was possible to carry on publicity work at a very small cost indeed. For the year ending March 31st last he had spent only £141, which was the largest he had ever spent in one year, and for this he had produced and sent by post 23,000 different pieces of advertising literature. During the past seven years the load collected had increased by an average of 19.7 per cent. each year, whilst the average increase in sales was 25.2 per cent. He welcomed the suggestion of the formation of a Committee to create a central organisation for dealing with publicity work, as central station engineers had not the time

to do this work thoroughly. He fully agreed with the policy of encouraging wiring contractors, and agreed also with the Author that profits should be utilised for reducing capital expenditure. The curse of municipal electric supply in some places was the way in which the profits were "filched" from the undertakings to feed the rates. This in his opinion was the absolute negation of the municipal ideal. The only justification for municipal control was to supply electricity at such a low price that it was within the reach of every inhabitant. He believed the reason that the municipal representatives of the Publicity Committee had been practically thrown out was that the undertakings as a whole in the country did very little indeed to support this Committee. This attitude was entirely wrong, and all electric supply undertakings ought to be willing to assist handsomely in any organisation formed for publicity work. He hoped Mr. Vignoles would move a resolution at the Annual Meeting that the new Committee which he had suggested should be formed. If this were done it would mark the 1914 Convention of the Association as a starting point of a new era in electric supply progress. He would suggest that of this Committee there should be representatives not only of the Association, of the B.E.A.M.A., the Electrical Contractors' Association, and of the Institution of Electrical Engineers, but of every class of industry, including the Cable Makers' Association, in order that they could confer together and decide what should be done in the future.

Mr. A. H. SEABROOK (Chief Electrical Engineer, St. Marylebone) said that although he had not had time to read the Paper carefully, he agreed with it generally, but there was one point in it with which he disagreed. He placed the very greatest importance upon municipal undertakings which had wiring powers sticking to them and exercising them. Those undertakings which had not these powers should get them if they possibly could, not from the point of view of making of profits on the apparatus, but on account of the numerous points by which the servants of the undertaking could get into contact with the consumer and so extend the business. Rather than give up these powers if there was any obstacle to the co-operation which most of them were wanting, he would even suggest that any profits made by the undertaking on these sales should be pooled for the benefit of the electrical industry in the particular area. He was in entire agreement with the Author in the suggestion for the formation of what he might call a Development Committee on the lines of the Electrical Vehicle Committee, which had done such excellent work. Finally, he referred to the late Industrial Committee of the Institution of Electrical Engineers. Great things had been hoped for from this Committee, and it was undoubtedly by the Institution of Electrical Engineers that a central commercial organisation should have been created. It was, however, most disappointing that at the Annual General Meeting there were ten members of the Institution present, and the only ones who had anything to say in the way of criticism of the policy of the Institution were Mr. Hirst and himself—both members of Council. Nevertheless, it was well known that there was a strong undercurrent of dissatisfaction at the decision to disband this Committee, and it was astonishing to find the members taking so little interest. After all, the Council was elected by the membership, and it was the business of the individual members if they were dissatisfied with the policy of the Council to get the Council altered.

Mr. S. E. FEDDEN (Chief Electrical Engineer, Sheffield), speaking with regard to the remarks in the Paper as to contractors, said he had had "some trouble" in Sheffield on this matter of dealing through contractors, but got along very well all the same. The trouble to him was how to effect sales through a contractor, and perhaps Mr. Vignoles would tell him how to do it. He advocated the policy of fixing the price for supply for any particular purpose at a figure which it might be anticipated would be profitable a few years after that supply was actually commenced. For instance, at Sheffield in 1902 he fixed a tariff for power at 1d. down to 0.6d., and that tariff was in force to-day, with the exception of the addition of the charge of £4 per kw. and 4d. for extra high-pressure supply. This same policy he recommended in connection with heating and cooking, and the soundness of it was demonstrated in the power load at Sheffield, which had increased since 1902 from 2 million to 26 million units per annum. With regard to mains extensions, in anticipation of the growth of the demand in all new streets he now laid two pipes, one to take the low-pressure main for the present demand and another to take the high-pressure main for the cooking demand, which would come along later. This he regarded as necessary because houses in Sheffield were beginning to take from 17 to 20 kw. each, and this could not be dealt with by the low-pressure mains. Also in this connection he only charged against any consumer the actual cost of supplying him; in other words, he calculated out the cost of the small main which would be necessary to supply a particular consumer, and if he was likely to be profitable at a reasonable period he was connected up. In this way some thirty or forty thousand pounds had been spent in street work for the future. He looked upon lighting now almost as a by-product; indeed, he would connect a lighting consumer even at a small loss, because that consumer was a very good advertising agent for the under-

taking, and would in all probability be the means of getting a dozen other consumers who would all be profitable. He had found the four-light radiator to be a back number now. It was quite easy to push the heating business in Sheffield because people were taking up 3 and 4 kw. apparatus. He had sent out many of these with the option of return after being tested side by side with gas stoves, but none of them had been returned. The figure of 15s. per quarter for cookers on hire was much too high a price, and very little business was likely to be done at that figure. He had fixed his rental at 4s. 6d. per quarter, and the difficulty now was to get cookers delivered in sufficient quantities.

Mr. E. E. HOADLEY (Chief Electrical Engineer, Maidstone) urged the Council to consider seriously the desirability of at once endeavouring to get hire and hire-purchase powers, and to try to get later on the fuller powers of the I.M.E.A. Bill. During the past six or seven years there had been a terrific lot of talk about getting these powers, and people outside would soon begin to think that the Association was an Association of Members of Parliament rather than of Engineers. It was very little use reducing the charge for heating and cooking to a 4d. when the consumer was told that he would have to pay £8 or £10 for a cooker, and this in face of the fact that the gas company would put one in free of charge at 3s. 6d. per quarter. A man must be a fool or a very keen enthusiast on electricity if he used an electric cooker. He agreed with the advisability of encouraging contractors. In Maidstone there were six contractors, and they were encouraged to such an extent that without the Municipal Supply Department they would all go out of business next week. In fact, the Department did all the canvassing and saw the work through whilst the contractor took the profit; but this, however, he did not object to, as the Department took the profit of the supply to the customer.

Mr. A. C. CRAMB (Chief Electrical Engineer, Croydon) disagreed with the Author on the question of show-rooms. These in his opinion were absolutely essential as a permanent place where the inhabitants could obtain information. He did not see any particular virtue in being able to say that the publicity costs on an undertaking were small. At Croydon £1,200 a year was spent upon the publicity department, £500 of which was in salaries. He agreed that a central publicity organisation was absolutely necessary, but Mr. Ayton was not quite correct in saying that the provincial representatives were thrown out of the Publicity Committee. The facts were that municipalities cannot subscribe to exhibitions and that sort of thing, and consequently it was not fair for them to continue to take part in the deliberations of the Committee if they did not do their share in the financial support. Therefore, the only graceful thing to do was to withdraw from the Committee. As a matter of fact, it was no good forming the proposed Committee until the I.M.E.A. Bill was obtained, because the only thing that municipalities could do at present was to spend money upon literature. Therefore the Association should concentrate upon getting the Bill through Parliament in order that they could spend their funds upon genuine publicity work. If amicable arrangements could be made with the contractors, he, and he believed, most other engineers, would prefer this rather than to carry on a sales department, but contractors could not be expected to hire out cookers and similar apparatus. There was a want of sincerity in this matter on the part of the Electrical Contractors' Association, and he urged the Association to stick to their Bill.

ALDERMAN SMITH (Liverpool) was warm in his praise of the Paper, and still warmer in his condemnation of Mr. Seabrook for not having read it. It should be unnecessary, he said, for Authors to read their Papers at the meeting, and if members did not read the printed copies they should not come to the meeting at all. He strongly protested against the suggestion that municipalities who transferred profits to relief of rates were "filching" the profits of the undertaking, and objected to Mr. Fedden's proposition that consumers should be connected at a loss. He did not mind facing an expenditure that might not be an immediate profit, but would have nothing to do with a consumer who would be a permanent loss. Similarly, he would have none of Mr. Seabrook's pooling of profits for the benefit of contractors, and if his own engineer held with that view he would try to clear him out.

BAILIE WILLOCK (Glasgow) joined issue with Alderman Smith. He quoted the famous Scotch saying that each herring should hang by its own head, and objected to profits being allocated to relief of rates.

Mr. J. H. BOWDEN (Chief Electrical Engineer, Poplar) said that nowadays an electrical engineer required also to be a financier, an accountant, a salesman, a cook, and a good organiser, or else he failed in his vocation. In fact, the manager of to-day must have a diversity factor of ten and a load factor of 200 per cent. He objected to the rateable value system of charging mainly on the ground that the assessments would be made by another department. He did not believe that he had yet heard the last word with regard to cookers, but he had now obtained quite a satisfactory one for £6 or £7, and anticipated doing a large business with it even in an East End borough like Poplar.

COUNCILLOR CROWTHER (Sheffield) expressed his great appreciation of the Paper, and strongly disagreed with Alderman

Smith as to the allocation of profits to relieve the rates. Whilst he was willing to work in conjunction with contractors, he objected to having his hands tied, and maintained that he should have the same freedom of action as any private firm. In answer to the Author's suggestion that sales departments were not necessary, he would like him to ask the Sheffield Gas Company whether they thought their showrooms and sales department of no use to them. He believed that electrical contractors suffered their greatest competition, not from the municipal electric supply department, but from firms, such as drapers, who took up electric wiring as a side-line.

Mr. Vignoles replied briefly to some of the points raised.

### Boiler House Plant

Our representatives at the meeting at Birmingham have telegraphed the following brief report of the discussion yesterday. A fuller report will appear in our next issue.

Mr. LACKIE (Glasgow), Mr. TAPPER (Stepney), Mr. R. U. BAILEY (of Summer Lane, Birmingham), and Mr. BRYDGES (Eastbourne) preferred heating feed-water with exhaust steam from auxiliaries, instead of live steam heaters. Mr. Lackie also referred to the necessity of steel steam pipes to withstand superheat. He had found coal-measuring chambers unreliable. By means of indicating instruments and special tests, he had saved 20 per cent. in coal consumption. He is now experimenting with Taylor stokers for quick steam-raising and also steam meters. Mr. BEAUCHAMP (West Ham) said that the only difficulty with suction ash-plant was dust, and he is overcoming this. Spontaneous combustion of coal stock was referred to. Mr. Bailey had only had trouble when the proportion of sulphur was high, and had successfully stored ten thousand tons, the largest heap being four thousand tons. Mr. Brydges had had two cases of fire with slack in heaps only eight feet deep; he now used pea coal, and there had been no spontaneous combustion, although the sulphur contents were high. Mr. AYTON (Ipswich) had had no trouble with Nottinghamshire slack in heaps twelve feet deep; he also described a bonus system for rewarding the boiler hands for low coal costs. Air heating was referred to by several speakers, and Dr. FERRANTI summed up the difficulties as insufficient heating on the one hand and burnt-out grate-bars on the other.

The above are only a few of the points raised in a long and interesting discussion. There were several other speakers, and a full report will appear in our next issue.

### ELECTRIC TRACTION NOTES

There was a net profit of £842 upon the Brighton tramways undertaking last year against £931 in the previous twelve months. The cost of the Brighton Corporation Acts of 1912 and 1913, however, have been responsible for £737 being charged in this year's accounts, which is an item of exceptional expenditure. Commenting on the demonstration with trolley omnibuses, the Tramways Manager and Engineer says that notwithstanding the overhead wires, these vehicles are very mobile in traffic, and he anticipates their complete success in Brighton.

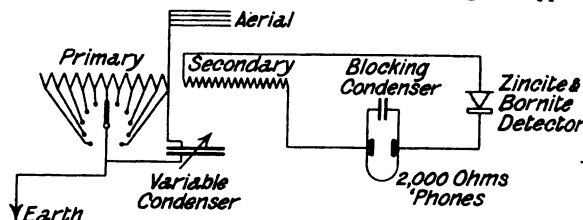
The proposed purchase of the Bristol Tramways & Carriage Co. by the Bristol Corporation has been further discussed by the Council. There is considerable opposition by the Bristol Ratepayers' Association, who held a special meeting last week, but the poll of the citizens resulted in favour of the purchase.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

During the debate in the House of Commons last week on the Post Office vote of £15,151,830, Sir Henry Norman called attention to the slow progress which has been made in connection with the Imperial wireless telegraph chain. He pointed out that ten months have passed since the contract with Marconi's Wireless Telegraph Co. was ratified, and although it had been said that the sites have been acquired, power plants have not yet been approved. He suggested that the Marconi Co. is now rapidly establishing a monopoly in wireless communications which could not fail to be disastrous to the public interest.

After writing off £5,000 for depreciation and transferring £4,000 to general reserve, a dividend of 1s. per share and a bonus of 1s. per share, making 3s. for the year ending March 31st, is recommended by the Directors of the Peel Conner Telephone Works. The amount carried forward is £6,58.

In connection with a system of wireless telephony which is being developed by Capt. Colin and Lieut. Jeance of the French Navy, who some time ago succeeded in communicating between ship and shore over a distance of some seventy miles, experiments have been conducted recently between the Eiffel Tower and places at various distances away, and communication established with portable motor-car receiving sets sixty miles away. Conversation is also reported to have been carried on between Paris and Finisterre (300 miles) on the same system. It is, however, of special interest to note that on Friday, June 5th, one of their conversations was overheard at a small amateur station in England, at Louth (Lincolnshire) by Mr. E. F. Blaze. The apparatus necessary for the reception of wireless telephone messages is, of course, almost identical with that used for wireless telegraphy, and Mr. Blaze tells us that he happened to be tuning his apparatus



to pick up the usual 600 metre wave-length, when he was surprised to hear voices. He was unable to distinguish the words, but could make out enough to recognise that the French language was being spoken. Subsequently he heard of the experiments mentioned above, and wrote to Captain Colin, who expressed great interest and confirmed that a 600-metre wave-length was in use at the time, with a power, however, of 2 kilowatts. For a distance of about 300 miles with an aerial 40 ft. high and 110 ft. long the result is remarkable for daylight conditions. Mr. Blaze sends us some particulars of his installation, which is equipped practically entirely with home-made apparatus, including a tuning coil which cost about 2s. 6d. The receiving connections are shown in the diagram. The chief difference from the usual arrangement of loose-coupled oscillation transformers is the use of a 20-way switch instead of a slider. The primary consists of a 5-in. tube, 2½ in. diameter, wound with No. 20 S.W.G. silk-covered wire tapped off to the 20-way switch. The secondary, which slides within the primary, is wound with similar wire, and has the detector and telephones in series with it. Wave-length from 200 to 1,760 metres can be tuned in.

Communication with Alaska *via* Seattle was again down on the 9th inst., since when telegrams have been sent *via* Ashcroft. Repairs were effected on the 12th inst.—The route *via* Moulmein-Kanburi to Siam was restored on the 10th inst.

**The Bradford Electrical Exhibition.**—The preliminary prospectus has just been issued of the Electrical Exhibition which is to be held at the Manningham Lane Skating Rink, Bradford, from the 6th to the 24th October inclusive. For various reasons it has been found impossible to hold such an exhibition until the present year, one of the chief being that a suitable hall to accommodate the exhibits could not be obtained, and another that the electrical manufacturers were not disposed to participate in exhibitions run on the lines which have hitherto been the practice. The British Electrical and Allied Manufacturers' Association have now come to an agreement with the Incorporated Municipal Electrical Association as to the lines upon which exhibitions should be run, and the Bradford Exhibition will be the first to be held in accordance with the terms of the agreement come to. The exhibition is being promoted under the joint auspices of the B.E.A.M.A. and the Bradford Corporation, each party having appointed a number of their members to form a Special Committee of Management. The persons elected by the Bradford Electricity Committee are the Chairman (Ald. G. H. Robinson, J.P.), the Deputy Chairman (Cr. J. Haley), Cr. A. Ayrtton, and Cr. H. Seed, and the City Electrical Engineer (Mr. Thomas Roles); while the B.E.A.M.A. have appointed Mr. H. C. Palmer (the General Electric Co., Ltd.), Mr. B. Longbottom (Electromotors, Ltd.), Mr. C. Rodgers (Siemens Bros. Dynamo Works, Ltd.), and Mr. A. J. Ireland (the British Thomson-Houston Co., Ltd.), with the Secretary (Mr. D. N. Dunlop). Mr. James M. Freer, of the firm of Freer & Howard, Ltd., who have been appointed organisers and managers of the exhibition, is also a member of the committee. The Special Executive Sub-Committee consists of Mr. Roles, Mr. Dunlop, and Mr. Freer. It is hoped that exhibits of textile and printing machinery, machine tools, laundry machinery, &c., will be displayed under working conditions driven by electric motors, and every facility will be given exhibitors for making such displays. All persons interested should apply to Freer & Howard, Ltd. (Ludgate Chambers, 30-32 Ludgate Hill, London, E.C.).

# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

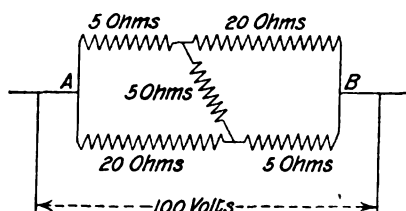
**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,396.

The diagram represents a set of resistances connected up as a Wheatstone's bridge. Show how to calculate the combined

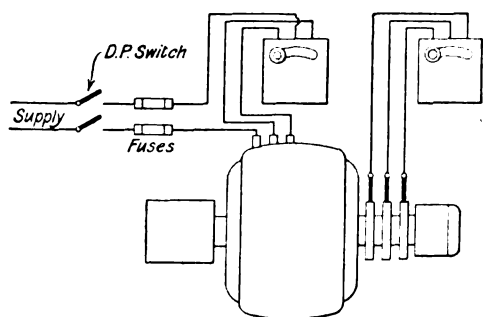


resistance between A and B, and the current that will flow through each arm of the circuit if a potential difference of 100 volts is applied between these points. "C. M. Y."

(Replies must be received not later than first post, June 25th.)

### ANSWERS TO No. 1,394.

The diagram shows the connections of a single-phase induction motor which is used for driving some rubber-grinding



machines. The main shafting is fitted with fast and loose pulleys, so that the motor can be started on no load. In spite of this, the belt has to be pulled round before the motor will start. The supply is single-phase, 50 cycles, 220 volts, and the motor is rated at 5 h.p., 935 r.p.m. Is there any way of getting the motor to be self-starting?—"SIMPLEX."

The first award (10s.) is made to "A. E. B." for the following reply:—

From the diagram given with the question it seems apparent to me that the motor already has a device for self-starting, shown in outline connected between the supply mains and stator terminals, but "Simplex" does not give any details of the internal connections of this. From the arrangement of leads I take it the machine has a three-phase winding on the stator, and that this starting device inserts a non-inductive resistance in series with one winding, and an inductance in series with the other winding, the third winding being, as shown, connected direct to main. The object of this is to split up the phase relations of the currents flowing in stator so as to obtain a near approximation to a three-phase supply, which in its

turn will produce a rotating field in stator. This rotating field cuts the rotor windings, and so causes it to rotate in the same direction as the field, which is the principle of all induc-

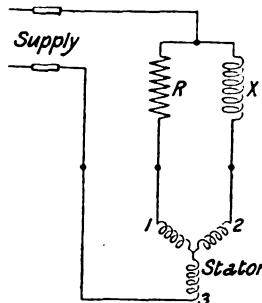


FIG. 1.

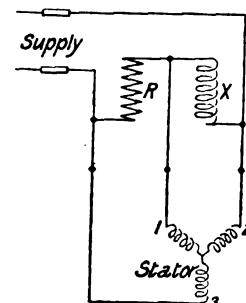


FIG. 2.

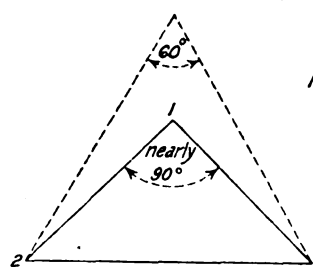


FIG. 3.

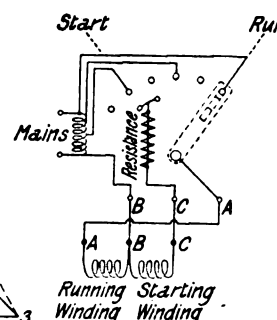


FIG. 4.

tion machines. When the motor is run up to speed the starting device can be cut out as the field will continue to rotate owing to the rotor reaction on stator windings.

Unfortunately the starting torque produced by this method is very low, and no doubt is not sufficient to overcome the inertia of the shafting, &c. Fig. 1 shows diagrammatically what I consider is the present method of starting, and its connections to stator. Fig. 2 gives another arrangement of connections which could probably be made by the same apparatus. This arrangement is, I believe, in fairly general use, and gives a much greater starting torque than Fig. 1. It has the advantage of full voltage across the terminals of stator, with the starting device connected as a shunt to the third terminal. Fig. 3 gives the vector diagram of this arrangement, the numbers 1, 2 and 3 corresponding to those given in Fig. 2. It will be seen this very closely approximates the vectors for three-phase supply, which are shown dotted. I think if "Simplex" will alter his connections to those shown in Fig. 2, he will overcome the self-starting difficulty.

The second award (5s.) is made to "H. J. E.," who writes as follows:—

There should be no difficulty in getting the motor to start against 30 per cent. full load torque, for a current equalling twice full-load current, provided there is sufficient displacement between the current in the starting winding and the current in the running winding. This displacement can be increased by placing a coil of eureka wire in series with the starting winding. Then by using an auto-transformer, some of the existing resistance in the rotor starter can be permanently cut out, thus allowing larger currents to flow in the windings without drawing an unreasonable current from the mains. The actual current demanded from the mains is less than the current in the motor windings by nearly the same proportion in which the voltage on the motor is reduced from that of the mains. The best ratio for the two currents, as well as the value for the resistance in the starting winding, will have to be found by experiment. The connections for the auto-transformer are shown in Fig. 4. The starter arm carries two brushes, both of which are connected to it electrically.

**The Faraday House Journal.**—The summer term issue of this bright little magazine contains full information as to the doings of old Faraday House Students. A special article is devoted to the Ljungström steam turbine, made by the Brush Electrical Engineering Co., which is now affiliated to Faraday House. An 800 h.p. Diesel engine is illustrated and described in another article, and a special contribution by Mr. J. T. Irwin deals with power transmission from the farmers' point of view.



# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published June 11th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

8,956/13. **Manufacture of Tungsten.** A. JUST. In this process a small percentage of another metal, such as vanadium, molybdenum, chromium, or tantalum, is added to the previously prepared pure tungsten, and the mixture is gradually heated up to about 2,000° C. according to the ordinary sintering process, or alternatively, the mixture is melted at a temperature of 3000° C. In both methods the maximum temperature must be maintained for some time to allow the tungsten to dissolve the added metal. The mixture is then suddenly cooled so that a crystalline solid solution of one of the above metals in tungsten is obtained. This product is then tempered in an electric furnace in a current of pure hydrogen or nitrogen, and is then found to be well suited for wire-drawing.

15,550/13. **Circuit Protection.** B.T.-H. Co. (G.E. Co., U.S.A.). On transmission systems, unduly high voltages are sometimes produced by various causes, e.g., lightning, and consequently discharges take place between the conductors of the system and the ground. Ordinarily, these discharges are oscillatory in character, and give rise to oscillations of energy on the system which may become dangerous. To obviate this possibility this invention requires that the discharge between the system and earth is localised at one particular place, by reducing the insulation value at this point. Also, the discharge must be made to take place through a resistance having approximately the critical value corresponding to the capacity and inductance of the system. The discharge is then aperiodic, and no oscillations of energy are set up in the system. The invention is applicable to underground and overhead systems. Two figures.

16,969/13. **Telegraph Receiver.** EASTERN TELEGRAPH CO., LTD., and J. SEFTON JENKINS. The invention relates to receivers in which an electric motor drives a perforator, and at the same time feeds the tape forward as required. It describes a method of maintaining the motor in phase with the signals received. This is effected by the use of a commutator, which, when the receiving apparatus is out of phase with the incoming signals, closes the circuit of an electromagnet through a relay. This electromagnet causes a ratchet wheel to rotate step by step through a pawl, and thus operates the arm of a rheostat, which corrects the speed of the motor. An auxiliary switch is also closed, which short-circuits a portion of the field or armature resistance momentarily, and thus causes a comparatively large temporary decrease or increase in the motor speed, and brings it into the correct phase. Five figures.

22,319/13. **Arc Lamp Carbons.** H. AYRTON. The negative electrode consists of a tubular rod of carbon, coated on the outside with a thin metallic film preferably of copper. The object of this film is to regulate the rate of burning of the negative carbon. By having the former of suitable thickness, the latter can be made to burn away at the same rate as the positive electrode. It is found that increasing the thickness of the film makes the carbon burn more slowly. Three figures.

26,802/13. **Electrostatic Separators.** J. KRAUS. In the usual type of these machines, trouble has hitherto been caused by the sparking of the electrodes. This disadvantage is obviated by using electrodes made of partially conducting material, such as wood, marble, or paper, in place of metal ones. The material to be separated is allowed to fall vertically between two or more charged electrodes. Endless conveyor bands passing over the surface of the electrodes serve to carry away the attracted material, which is discharged into conduits. Two figures.

26,906/13. **Dynamo Regulation.** R. BOSCH. A method of automatically regulating the current or voltage of a dynamo by varying the exciting current through a granular carbon resistance. The pressure on the granules is determined by an electromagnet, of which the strength is controlled by the factor to be regulated. An extra resistance is introduced into the circuit when the current rises beyond a certain limit. Six figures.

## Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

Arc Lamps: AYRTON, 12,082/13.

Distributing Systems, Cables and Wires, &c.: BEAVER and CLAREMONT [Cable manufacture] 13,602/13.

Dynamos, Motors, and Transformers: B.T.-H. Co. (G.E. Co.,

U.S.A.) [Motor control systems] 14,796/13; ALLMANNA SVENSKA ELECT. AKT. [Bar-wound A.C. machines] 8,565/14; SIEMENS SCHUCKERT. GES. [Starting and synchronising rotary converters] 9,225/14.

Heating and Cooking: MANN [Heaters] 11,993/13; CAMPBELL [Heating units] 15,014/13.

Ignition: LANGNER [Engine ignition system] 7,232/13; ELIA [Submarine mine ignition] 25,397/13; UNTERBERG and HELMLE [Magneto apparatus] 3,832/14.

Incandescent Lamps: HARRISON [Lamps] 12,054/13.

Instruments and Meters: EVERSHED & VIGNOLES and NEEDHAM [Electrical step by step motion] 28,234/13.

Switchgear, Fuses, and Fittings: SIMPLEX CONDUITS, LTD., and WATERHOUSE [Conduit system fittings] 12,115/13; WALKER [Junction-boxes] 14,848/13; FAHN and HUTTON [Switches] 17,275/13; MURRAY [Cut-outs] 17,345/13; DE OLAZABAL Y. EULATE [Thermal circuit breaker] 25,236/13.

Telephony and Telegraphy: AUTOMATIC TELEPHONE MFG. CO. (Automatic Electric Co.) [Telephone systems] 12,035/13, 12,162/13; HODGKINSON [Selectors] 12,100/13; GLOVER [Telephonic apparatus] 12,821/13; CARDWELL [Printing telegraph] 17,439/13; WESTERN ELECTRIC CO. (Woodward) [Telephone transmission system] 18,018/13; [Vacuum lightning arresters] 28,894/13; HICKMUTT [Telephone attachment] 4,397/14.

Miscellaneous: B.T.-H. Co. (G.E. Co., U.S.A.) [Air compressors] 11,996/13; SNOOK [Vacuum regulator for X-ray tubes] 12,256/13; B.T.-H. Co. (G.E. Co., U.S.A.) [Engine governor] 12,477/13; SOUTHGATE [Striking mechanism] 14,027/13; KIENZLE [Electrical machine tools] 24,686/13; SIEMENS BROS. DYNAMO WKS., LTD. (Siemens Schuckert. Ges.) [Spinning machines] 29,308/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

Dynamos, Motors, and Transformers: STORER [Dynamo machinery] 12,641/14.

Electrometallurgy and Electrochemistry: HANRIOT [Electrochemical reduction] 11,950/14; COUTAGNE [Nitride furnace] 12,057/14; A.E.G. [Welding] 12,479/14.

Ignition: BOURSIN [Petrol motor starting gear] 10,480/14; MICHELIS [Engine ignition] 12,347/14.

Incandescent Lamps: LEDERER [Gas filled lamps] 12,156/14, 12,157/14, 12,158/14.

Instruments and Meters: A.E.G. [Induction meter] 11,844/14. Storage Batteries: FORD [Accumulators] 10,100/14; SCHOLZ [Carbon electrodes] 10,171/14.

Telephony and Telegraphy: SIEMENS & HALSKE AKT. GES. [Automatic and semi-automatic telephony] 12,483/14.

Miscellaneous: NORMA CIE. GES. [Magnetic fixing devices] 11,993/14.

The following Amended Specifications may now be obtained:—

Electrometallurgy and Electrochemistry: PAUL SCHMIDT UND DESGRAZ G.M.B.H. [Electrolytic separation of copper] 3,722/13.

Miscellaneous: G. F. LYON [Electro pneumatic control] 3,757/13.

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

11,340 of 1900. **Electric Clocks.** M. FISCHER. A system of maintaining synchronism between a number of clocks and a master clock. The latter is driven by weights in the ordinary way, and each minute it releases an auxiliary wheel train which is also driven mechanically, and connected with the armature of a magneto. The subordinate clocks are connected by wires with the magneto coils, and are also provided with similar magneto machines. The armatures of the subordinate clocks thus move synchronously with that of the master clock, and the motion of these armatures is transmitted to the clock hands through springs which convert the abrupt motion into a continuous one. The claims also include for the use of a thin steel band in the master clock in place of the ordinary gut or steel wire. Eight figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

Arc Lamps: F. M. LEWIS [Clutch mechanism] 4,557/03; B.T.-H. Co. (G.E. Co., U.S.A.) [Central draught lamps] 4,831/07.

Ignition: T. WARDELL [Magneto] 4,339/08.

Instruments and Meters: A. BLANCHET [Induction type of A.C. meter] 5,010/02.

Switchgear, Fuses and Fittings: FELD BROS. & Co. [Plug cable coupling] 20,035/09.

Traction: J. O. HEINZE [Magnetic wheels for braking] 23,491/02.

Miscellaneous: C. L. BURDICK [Colouring process] 4,211/05.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 353. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**BOILER PLANT, &c.**—A booklet from Babcock & Wilcox, Ltd. (Oriol House, Farringdon Street, E.C.), gives illustrated descriptions of the well-known B. & W. water-tube boiler in its land and marine forms, and of the patented superheater which is used in conjunction with them. A portable pattern of boiler, arranged so that no piece exceeds 280 lbs., is made for foreign and Colonial work where transport is difficult. The firm's chain grate stoker is also described and illustrated, and further notes are given on steel chimneys, water-softening plants, feed-water heaters, steam piping and coal conveyors, and the interesting suction system of ash disposal which they introduced recently. A few illustrations are also given of electric crane installations, which represent a very extensive branch of the firm's activities.

**PERIOD DESIGNS IN FITTINGS.** An interesting booklet from Simplex Conduits, Ltd. (116 Charing Cross Road), entitled, "Notes on Period Designs in Electric Light Fittings," contains a series of articles on this subject by Mr. T. Birkett, late of the firm of Jesson & Birkett, whose business is now incorporated with that of Simplex Conduits, Ltd. The subject is treated historically, and the development and characteristics of the French, Dutch, English, and other "period" styles of decoration are treated in an interesting manner.

**COOKING APPARATUS.**—A new price list from the Brompton & Kensington Accessories Co., Ltd. (254 to 260 Earl's Court Road, S.W.), describes standard B. and K. cooking apparatus manufactured by them, including complete cooking stoves of several patterns, with combined ovens, grills, hot cupboards, and boiling plates, large cooking ranges, and separate hot cupboards and carving tables, as well as grills and toasters.

**WASTE-OIL FILTER.**—A catalogue from A. C. Wells & Co. (Midland Road, St. Pancras) describes the Wells patent waste-oil filter, which is made in several sizes. The oil is first syphoned off from a settling chamber, after which it passes successively through two special filtering pads.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**DOMESTIC USES OF ELECTRICITY.**—A series of pamphlets which are being circulated by the City of London Electric Lighting Co., Ltd. (1 and 2 Great Winchester Street, E.C.), call attention to electrical water heating appliances, vacuum cleaners, and fans. The company has a scheme for giving free trials of their "Bankside" water heater for one week.

**SEARCHLIGHTS.**—A supplementary priced leaflet of commercial patterns of searchlight projectors has been issued by Crompton & Co., Ltd. (Chelmsford).

**SWITCHGEAR, &c.**—A leaflet from Donovan & Co. (47 Cornwall Street, Birmingham) gives prices of starters, fans, knife switches, and ironclad switchgear and fittings.

**DOUBLE HELICAL GEARING.**—Some useful data regarding the strength and dimensions of double helical gearing is to be found in the two lists, Nos. 9 and 10, which are to hand from the Power Plant Co. (West Drayton, Middlesex). Illustrations are given showing helical gears applied to a variety of drives.

**HACK SAW MACHINES.**—A leaflet from the Fortuna Machine Co., Ltd. (Leicester), describes a new and improved form of hack saw machine with a special form of universal vice, which enables a great variety of different kinds of work to be handled. The machine has several interesting features, and permits of a wide adjustment of the length of stroke.

**TANTIRON.**—This is the name of a special alloy of similar nature to cast-iron, but with acid-resisting properties. Its applications are described in an illustrated booklet from the Lennox Foundry Co., Ltd., Tantiron Foundry, Glenville Grove, New Cross, S.E.

**Simplex Conduits, Ltd.**—The branch and departmental managers of Simplex Conduits, Ltd., have just held their annual conference at Southport, under the presidency of Mr. L. M. Waterhouse, the managing director of the Company.

### A NEW CONTINUITY GRIP

A SIMPLE and effective continuity grip for conduit fittings has been introduced by the Hemming Conduit Grip, Ltd. (174 Corporation Street, and 7A Dalton Street, Birmingham). The T fitting illustrated shows the arrangement adopted. The steel screws which make contact with the tube are in position in the fittings ready to receive the



THE HEMMING CONTINUITY GRIP.

tubes, and only need a half twist (to the left) to bring into operation the uncut portion of the thread which effectively grips the tube and sets up metallic contact. The driving home of the screws brings the hexagon head firmly on the base of the fitting, making a watertight joint. Even presuming the tubing to be used is undersized, it will only mean the uncut thread of the screw being brought more into play. The screw can be turned either with a box spanner or a screw-driver. The head of the screw is marked exactly over the machined part of the screw, so that if at any time the tube is to be released, all that is needed is to unscrew until the indicator faces the socket.

### RAILWAY STATION LIGHTING

THE photograph here reproduced shows an example of the effective station lighting arrangements which are being adopted on the Underground Electric Railways of London, Ltd., and represents the new booking hall at the Mansion House Station on the District Railway. This is



BOOKING HALL AT MANSION HOUSE STATION.

illuminated by Osram lamps in semi-indirect fittings known by the name "Latham." These consist of a japanned white reflector, opal diffuser, brass ring and chains. In another case, that of one of the arcades at the re-constructed Victoria Station, Osram lamps are used in 18 in. "Superlux" hemispheres, supported by aluminium painted iron rings.

**G.E.C. Head Office Fire Brigade.**—The Fire Brigade attached to the head office of the General Electric Co., Ltd., of 67 Queen Victoria Street, London, E.C., spent a very enjoyable time at Southend-on-Sea on June 5th, on the occasion of their annual outing. The party included the captain of the Brigade—Mr. W. H. Snowden—and Instructor Riley. Dinner was served at the Grand Pier Hotel.

## NEW CONDUIT FITTINGS

**A**MONG new conduit fittings recently introduced by the Sun Electrical Co., Ltd. (118-120 Charing Cross Road, W.C.), is a special junction box designed to meet the L.C.C. requirements for conduit work. These have lids placed internally and fixed by four screws; the edges of the boxes are machined to ensure watertight fit with the lid without



DOUBLE SPACING SADDLE.

packing. Another novelty is the form of spacing saddle illustrated here, which is for supporting conduit tube clear of the wall in damp situations. The base has a countersunk fixing hole sufficiently large to take a No. 10 wood screw, by means of which it is fixed to the wall. These are to take one, two, or three tubes.

## A LARGE SWITCHGEAR CONTRACT

**A**S announced in ELECTRICAL ENGINEERING, June 4th, page 304, the British Westinghouse Electric & Manufacturing Co., Ltd., have the contract for the high and low tension switchgear for the 11 sub-stations, in connection with the London & North-Western Railway Company's North London electrification. The panels on order at present total 258, comprising 129 H.T. panels and cubicles, 107 D.C. sub-station panels, and 22 low-tension A.C. and D.C. boards in the main station. The sub-stations are at Camden, Queen's Park, Stonebridge Park, Kenton, Pinney, Bushey, Dalston, Broad Street, Willesden, West End Lane, and Acton. There are three rotary converters in each, excepting at Broad Street and Acton, in which there are only two. The capacity of the six situated at Camden and Bushey is 1,000 kw., and of the remainder 750 kw. each. Thirty high-tension feeders come into the sub-stations, and there are also 18 H.T. outgoing feeders. The oil break circuit breakers are of British Westinghouse remote mechanically operated type, excepting in the case of Stonebridge Park, where they will be of the solenoid electrically operated type. Provision is made for phase separation throughout the whole of the structure, and each separate phase of the switch is contained in an independent tank, and in a separate moulded stone cubicle. The bus-bars are sectionalised, and each machine can be connected through isolating switches to either sections. Isolating switches are provided on each side of the main oil switches. All incoming feeders will be fitted with reverse current tripping relays, and all outgoing feeders and transformer circuits will have overload relays with time limit attachments. The rotary converter E.H.T. circuits will also be fitted with overload time limit relays. Each section of bus-bar will be fitted with horn type static dischargers combined with the usual resistances and isolating switches. The panels on which are mounted the instruments and handles for operating the oil circuit breaker, are situated on the floor level, and behind them are the cubicles containing the oil switches. These are linked to the operating handles which are mounted on the switchboard by means of levers and rods. In the case of the Stonebridge Park sub-station, the operating panels will also be on the floor level, and the switches will be electrically operated. The cell work is to consist of moulded stone. The slate panels of which the H.T. control board and also the L.T. switchboards are made will not be enamelled, but will be finished with a black marine finish. The low-tension panels, exclusive of battery and booster panels, which form the subject of another contract, deal with 100 out-going feeders and 31 rotary converters on the D.C. side. The rotary converter circuits are fitted with reverse current single-pole circuit breakers, fitted with a tripping arrangement for operation by speed-limiting devices on the rotaries. The track feeder panels which control both poles of one feeder are fitted with single-pole over-load circuit breakers for 2,000 amp., and two single-pole knife switches for the same current. Sector pattern moving coil ammeters are used, and have illuminated dials. The circuit breakers are of the well-known Westinghouse type "C" traction pattern. In addition to the above panels there are lighting and auxiliary panels in all the sub-stations, and in

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must not only "look" all right: they must BE all right: they must leave nothing to chance: there must be nothing experimental about their adoption.

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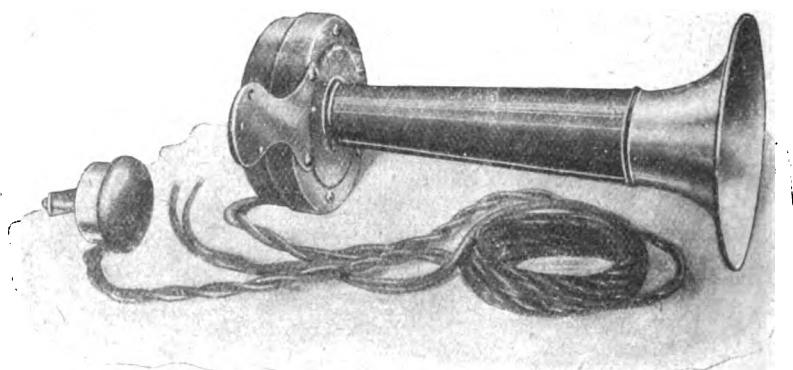
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**AERATORS, Ltd.** (Dept. EES) Upper Edmonton, London, N.

the power station a low-tension alternating current and low-tension direct current board are also to be supplied under this contract for dealing with the circuits feeding the auxiliary machinery, lighting, &c. The contract is estimated to be worth between £50,000 and £60,000.

## THE DEAN ELECTRIC HORN

**A** SIMPLE and compact electric horn for motor-cars and motor-cycles has been put on the market at a very reasonable price by the General Electric Co., Ltd. The sounding mechanism consists of a steel diaphragm, which is set vibrating by blows from a stud carried by the armature of a laminated electromagnet. The mechanism is similar in principle to that of the common trembler bell, but the con-



THE DEAN ELECTRIC MOTOR-CAR HORN.

struction is entirely different. The weight of the complete motor-car horn is 2½ lbs. if fitted with the standard 10 inch projector, or 2 lbs. with a 5½ in. projector. The finish is in black and nickel, or black only for fixing under the bonnet. The "Dean" horn is guaranteed for five years. It is water-tight and dust-proof, and the push-switch supplied with it differs from the usual push in that it is not a small button or plunger, but the upper cap effects contact over almost its entire surface, which is 1½ in. in diameter. A touch upon any portion suffices to close the circuit. A smaller pattern is made for motor-cycles.

**A Large Illuminated Hoarding.**—Siemens Bros. Dynamo Works, Ltd. (Dalston), have sent us particulars of an illuminated hoarding situated at Neasden facing the Metropolitan and Gt. Central Railways. This is illuminated by fifty 200 c.p. Wotan lamps, each in fittings throwing a maximum amount of light direct on to the hoarding. The experiment has proved completely successful, and this kind of illumination of hoardings should become very popular. The running cost is not excessive, and could be still further reduced by the application of half-watt lamps. The Neasden hoarding is under the control of Messrs. Hutching and Mills, and the current is supplied by the Metropolitan Railway from the Neasden generating station.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—Electrically-operated car shed cranes for the Melbourne Suburban Railways. Consulting Engineers, Merz & McLellan, 32 Victoria Street, S.W. July 6th.

**London: L.C.C.**—Tenders are invited for five 1,500-kw. rotary-converters, fifteen main and two starting transformers for use therewith, and dismantling, removal, and re-erection of existing motor-generators. Also overhead 20-ton hand-crane. Tenders by July 14th. (See advertisement on another page.)

Tenders are invited by H.M. Office of Works for one year's supply of incandescent lamps. July 6th. (See advertisement on another page.)

**Lowestoft.**—A distributor is to be laid at an estimated cost of £190.

**New Zealand.**—The New Plymouth Council requires additions to a 2,300-volt sub-station switchboard, including three transformer panels, one coupler panel and four feeder panels together with instruments. A copy of the specification may be seen at 73 Basinghall Street, E.C.—The Oamaru Council proposes to raise a loan of £24,000 for an electric lighting scheme.—The Invercargill Corporation proposes to extend its electric lighting system at an estimated cost of £10,000.

**Skelton and Brotton.**—Tenders are invited for transformers, sub-station equipment, public lighting fittings, and overhead and underground cable. Consulting Engineers, Messrs. May & Hawes, Caxton House, Westminster, S.W. July 2nd.

**Sweden.**—Four transformers for the Royal Swedish Water-Power Administration. A copy of the specification may be seen at 73 Basinghall Street, E.C. Tenders by July 4th to "Kungl. Vattenfallsstyrelsens Elektrotekniska byrå, Regerings-gaten 45," Stockholm.

**Truro.**—The following are the items of capital expenditure anticipated in connection with the Council's electric lighting scheme:—Two 100-kw. generating sets, £3,650; overhead mains, £3,450; buildings, £1,300; services and meters, £350. Dr. J. A. Purves, of Exeter, is Consulting Engineer.

### Wiring

**Clogheen (Ireland).**—Tenders are to be invited for the electric lighting of the workhouse.

**Rhondda.**—Electrical installation at the Fever Hospital, Ystrad Rhondda, comprising 330 lighting points. Clerk to Council.

**Rochester.**—Tenders are invited for lighting the Corn Exchange buildings. Particulars from Mr. W. Banks, City Surveyor. Tenders by June 30th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Brighton.**—New concert hall on the site of the Aquarium.

**Dundee.**—Extensions to Dundee Post Office. H.M. Office of Works, London.

**Manchester.**—New technical school at Irlam.

**Pontypridd.**—Alterations and extensions at workhouse (£27,000).

**Ramsbottom.**—Warehouse and offices, Rose Bank Printing Works.

**Rochdale.**—Weaving shed. Builders, T. Ashworth & Sons.

**Sheffield.**—Extensions and alterations to Lodge Moor Hospital (£68,000).

**Sunderland.**—Extension to technical college.

### Miscellaneous

**Exeter.**—Twelve months' supply of electrical stores for the Devon County Asylum. Clerk, County Chambers, Main Street.

**Rotherham.**—Tenders are invited for tramway stores and materials, bitumen-covered and rubber-insulated cable, trolley wire, and ampere-hour meters. Tenders by July 8th. Particulars from Engineer and Manager, Electricity Works.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Devonport.**—The following tenders have been accepted:—Cables, Callender's Cable & Construction Co.; rubber-covered wires, Liverpool Electric Cable Co.; meters, British Thomson-Houston Co.

**Hindley.**—The tender of the British Insulated & Helsby Cables Co. has been accepted for cable.

**London: Hammersmith.**—The tender of Messrs. T. Wragg & Sons for cable-ducts is recommended for acceptance.—The tender of the British Electric Transformer Co. for six 100-kw. and a supply of other sizes of transformers, has been accepted.

**Manchester.**—The Corporation has accepted the following tenders:—L.T. switchgear, Ferguson, Pailin & Co.; cables, Johnson & Phillips, British Insulated & Helsby Cables, and W. T. Glover & Co.

**Salford.**—The tender of the British Westinghouse Co. for a 5,000-kw. turbo-alternator at £14,137 has been accepted. This acceptance is subject to the L.G.B. sanction, the inquiry having been held last week.

**Wallasey.**—The following tenders have been accepted in connection with the new generating station at Poulton:—Ferranti, Ltd., £1,304 for transformers; M. L. Prat (London), £1,084 for three steel chimneys.

The Corporation have made a contract with the British Thomson-Houston Co., Ltd., for twelve months' supply of their type R.H. A.C. meters.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £64 to £64 10s. (Last week, £64 5s. to £64 15s.)

**Agency.**—Morris & Lister, Ltd. (3 and 4 Palace Chambers, Bridge Street, Westminster, S.W., and Carlton Works, Lockhurst Lane, Coventry) who have hitherto been representing Nalder Bros. and Thompson, Ltd. (97A Dalston Lane, N.E.), to a limited extent for the sale of their manufactures, have now been appointed representatives in the London and country districts, heretofore worked by Frampton & Paine, whose agreement for the agency has now expired.

**The Bachelet Levitated Railway.**—We learn that the Directors of this scheme, upon which we commented in our Electric Traction Notes column last week, have decided not to proceed to allotment. The reason given is the disappointing result of the public issue.

**Liquidations.**—A meeting of the Hydro Electrical Gear Co. will be held at 11 Pancras Lane, E.C., on July 14th, to hear the liquidator's account of the winding-up.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Barnsley Smokeless Fuel Co.**—This Company, which has been formed for the purpose of erecting and working in co-operation with the Old Silkstone Collieries, a smokeless fuel plant capable of treatment 200 tons of coal per day at Barugh, Barnsley, under the patents of the British Coalite Co., is making an issue of £50,000 6 per cent. participating preference shares. It is interesting to note that the surplus of gas from the smokeless fuel plant will be taken by the Yorkshire Electric Power Co., and used at their Barugh station for the generating of electrical energy.

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## LOCAL NOTES

**Barrow-in-Furness: Electricity Accounts.**—There was a net profit of £513 on the working of the electricity undertaking last year, compared with £701 in the previous twelve months. The increased capital charges, however, are mainly responsible for the lower result. The revenue increased by nearly £2,500, and the number of units sold by some 300,000. The total working costs were 1·821d. per unit against 1·294d. per unit in the previous twelve months.

**Brentford: Gas Co. and Electricity Powers.**—We reported some time ago that the Brentford Gas Co. was granted powers by a House of Lords Committee to take transfers of electric lighting Orders within its area, and also power to apply to the Board of Trade for electric lighting Orders within its area where there is at present no statutory authority. The Metropolitan Electric Supply Co. at that time opposed, but unsuccessfully. The Gas Co. has now objected to the *locus* of the Electric Supply Co. in the House of Commons, and the point was fought before the Court of Referees on Thursday. Mr. Balfour Browne, K.C., for the Electric Supply Co., argued that the powers which had been granted by the House of Lords Committee to the Gas Co. constituted a form of competition, especially as regards bidding for the purchase of existing electric lighting Orders, whilst the power to apply to the Board of Trade for new electric lighting Orders brought competition a step nearer than it was at present. The Court, however, decided that the Metropolitan Electric Supply Co. would only be entitled to a *locus* if the Gas Co.'s Bill gave powers to actually compete in the supply of electricity, which it held was not the case. The *locus* was therefore disallowed.

**Dover: Kent Coal.**—A report has been presented by the Corporation Electrical Engineer dealing with a two-days' trial with Snowdown (Kent) coal. The evaporative power was found to be 10·69 lb. of steam per lb. of coal, against 10·6 lb. of steam per lb. of coal for the Featherstone washed coal now used. It was pointed out, however, that Kent coal caked into large masses which there was difficulty in breaking up, and therefore could not be burned very satisfactorily, nor could it be relied upon for a sudden call for extra steam. It was decided to make a further test with Tilmanstone coal, as the manufacturers of the boilers are anxious to see if Kent coal can be burned satisfactorily with chain-grate stokers.

**Hastings: Electricity Accounts.**—The electricity accounts for the year to March 31st show a net profit of £1,297, after meeting capital charges amounting to over £11,500.

**Horwich: Electric Supply.**—The South Lancashire Tramways Co. has informed the District Council that it has no powers to supply electricity in this district. The Bolton Corporation are to be asked for terms.

**Manchester: Development of Electricity Undertaking.**—On p. 314 of our issue for June 4th, we gave the financial result of the past year's working of the electricity undertaking. From the report of the Committee just to hand we notice that during the year supplies have been furnished to the following important consumers through sub-stations on their own premises:—Messrs. Armstrong, Whitworth & Co.; the Fine Cotton Spinners' Association; the Clayton Aniline Co.; Messrs. C. Macintosh & Co.; the National Wire Manufacturing Co.; Messrs. Slack & Brownlow; the John Nicholls Manufacturing Co.; Messrs. J. Byrom & Sons; the Great Central Railway Co. The efficiency of the distributing system as a whole was 84·49 per cent., being a decrease of 0·63 per cent. on the previous year. A contract has been placed with the Lancashire Water Cooler Co. for an installation of "open-type" water coolers, which it is anticipated will be a great improvement on the present plant. Contracts have also been placed with the Chloride Electrical Storage Co. for a traction battery at Dickinson Street, and with Bruce Peebles & Co. for additional converting plant. Although there has been a slight increase in the coal costs at Dickinson Street and Bloom Street, there was a slight decrease at Stuart Street, but taking the stations as a whole, there has been a slight increase. In the Street Lighting Department has to be noted the equipment of Stretford Road and the beginning of the electric lighting Order of important main roads.

**Middleton: Fixed Price System.**—The Council had decided to discontinue the supply of electricity to houses at a fixed annual charge, from the September quarter.

**Swansea: Electricity Demands.**—At the last meeting of the Electric Lighting Committee it was reported that there are increasing demands for power within a radius of one mile outside the Borough boundary. It was decided to approach the Board of Trade on the matter with regard to specific instances if the Board will not grant a sort of roving commission within this area without the formalities of an electric lighting Order.

**Wallasey: Close Estimating.**—At a special meeting of the Council last week attention was called to the very close approximation between the estimated and the actual figures for the new power-station at Poulton. The land had been put down at £18,000, whereas the actual figure came out to £12,673; buildings and works at £11,000, against an actual figure of £12,232; plant at £40,757, against an actual figure of £39,348. The result was an actual total of £64,253, against the estimated figure of £64,757.

**York: Electricity Accounts and a Showroom.**—The accounts of the Electricity Department for last year show an increase in revenue of £1,500, and an increase in expenditure of £3,500. Although at first sight this might seem to be somewhat poor business, the Chairman of the Electricity Committee reminded the Council that it was due solely to reductions in the charges made to private consumers and to the tramways. There was some criticism as to the necessity for retaining a showroom for the purpose of exhibiting electric cookers, but the reason for this was that the showroom where the fittings are housed is too small to show the cookers and fittings together. The opposition, however, succeeded in carrying its point, and the recommendation to retain the old showroom and offices in addition to the new ones was defeated.

## APPOINTMENTS AND PERSONAL NOTES

The proposal to raise the salary of Mr. A. H. Shaw, Borough Electrical Engineer at Ilford, from £500 to £525 per annum, has been deferred for further consideration.

The salary of Mr. T. Hall, Borough Electrical Engineer at Burton-on-Trent, is to be increased from £275 to £350 per annum, with a further increase of £50 per annum in 1915.

Mr. F. C. Sprigg has been appointed Electrical Engineer to the Turton U.D.C.

Mr. C. W. Jackson, Borough Electrical Engineer at King's Lynn, has been granted a bonus of £40 for extra work in connection with extensions during the past eighteen months.

The salary of Mr. F. R. Hobley, First Assistant Engineer in the Lowestoft Electricity Department, has been increased to £3 per week.

In view of the resignation of Mr. H. Love, Fourth Engineer-in-Charge at Hammersmith, who has obtained a similar appointment at Shoreditch, Engine-Driver J. E. Pearce has been promoted temporarily on trial to the vacant position at a salary of £180 per annum.

Mr. H. J. Groves Webb has resigned his position as Manager of the Apparatus Department of the Electrical Co., Ltd. (122 Charing Cross Road, W.C.), with whom he has been connected for the last five years.

A Chief Lecturer and Head of the Electrical Engineering Department is required at the Salford Royal Technical Institute. Salary £225 per annum. Applications by June 26th to Director of Education, Education Office, Salford.

## NEW COMPANIES

**SCOTTISH WELDING & ELECTRICAL CO.**—Registered by J. J. Weldon, 135 Wellington Street, Glasgow. Capital £1,000. Electrical engineers, motor and motor car manufacturers. (Private company.)

**NITRATE HEATING & POWER**, 110 Cannon Street, E.C. Capital, £6,000. To supply power and heat for the treatment of nitrates in the Republic of Chile, &c.

**PARK ROYAL ENGINEERING WORKS**, 34-6 Gresham Street, E.C. Capital, £20,000. To carry on the business of electricians, mechanical engineers, suppliers of electricity, &c., at Park Royal, Middlesex.

**MANCHESTER CABLE CO.**, registered by Jordan & Sons, 116 Chancery Lane, W.C. Capital, £1,000.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 391 [VOL. X., No. 26]

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THURSDAY, JUNE 25, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price **1d.**

### SUBSCRIPTION RATES.

United Kingdom. **6s. 6d.** per Annum.

Canada. **8s. 8d.** per Annum.

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Displayed Advertisements, *Tuesday first post.*

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 208-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

### SUMMARY

THE Birthday Honours List includes a knighthood for Mr. J. F. C. Snell. (Page 356.)

THE journey of the Krieger electric landulette from London to Birmingham and back, in connection with the Convention, is described. (Page 356.)

THE discussion on Mr. Fedden's Paper on boiler house equipment, &c., a summary of which was published in our last issue, is reported at length, and contains matter of an extremely practical and useful nature. (Page 357.)

A DESCRIPTION of the visit to the B.T.-H. works at Rugby, and of the same firm's meter works, appears on page 360.

MR. J. H. BOWDEN's Paper on the "Standardisation of Tariffs," read at Stratford-on-Avon on Thursday, advocated a tariff made up of a fixed charge and a charge per unit, but condemned the Norwich system as the most pernicious that had ever been introduced. Mr. Bowden explained his method of assessing the fixed charge by means of the assumed diversity factor for each class of supply. In the discussion, Mr. Bowden's system was severely criticised, and the debate centred chiefly around the rateable value system of charging. (Page 361.)

THE "Point Fives" debate, which lasted from midnight on Thursday to 2 a.m. on Friday, discussed many practical points. Mr. S. T. Allen (the Chairman) favoured standardisation of cookers, gave some figures to show the enormous advance of cooking under the 0.5 tariff, and raised an interesting point in connection with electric vehicle charging. Mr. Roles and Mr. Vignoles thought that there should be better representation of

the Point Fives on the Council of the I.M.E.A.; Mr. Seabrook said that he can keep up a supply of hot water more cheaply with electricity than with gas by the use of improved thermostats; Mr. Christie said he was applying to the L.G.B. for a loan to enable him to buy cookers and heaters for hiring out; Mr. Fedden explained some new and successful charges employed at Sheffield; and Mr. Grogan opposed connecting cookers across 400 or 500 volt outers. (Page 365.)

MR. H. RICHARDSON (Dundee) has been elected President of the I.M.E.A. for the coming year. At the annual general meeting on Friday an interesting statement was made with regard to the I.M.E.A. Bill, the establishment of a "Development Committee" to encourage the use of electricity was agreed to, and other matters were discussed. (Page 366.)

A NEW pattern of accumulator for dealing with intermittent supply to exhaust steam turbines is being introduced. (Page 368.)

A NEW protective system for isolating faulty feeders is described, with diagrams. The disconnection of the cable is effected through relays energised by ring transformers placed over the cables. (Page 369.)

THE annual inspection of the National Physical Laboratory was held on Friday last. (Page 370.)

AN Optophone, invented by Dr. E. E. Fourmier D'Albe, was shown at the recent Royal Society Conversation, and is dealt with in a short article. (Page 370.)

A NEW insulation tester is described in an illustrated article. (Page 371.)

A CORRESPONDENT desires further information as to the causes which led to the disbanding of the Industrial Committee of the Institution of Electrical Engineers. (Page 371.)

ONE of the specifications published last week describes a method of constructing an artificial line to balance a telephone transmission line loaded according to the Pupin system.—The Cooper-Hewitt mercury vapour lamp and a system of pneumatic-electric motor control are the subjects of two Patents which expire this week after lives of fourteen years. (Page 373.)

THE use of three-phase induction motors for braking is discussed in our Questions and Answers columns. (Page 374.)

THE Bill for the joint working of the Great Northern and City Railway by the Metropolitan and Great Northern Railway Companies has been withdrawn in consequence of the onerous conditions imposed by a Parliamentary Committee.—The annual congress of the Tramways and Light Railways Association is to be held at Newcastle. (Page 375.)

THE final report of the liquidator of the National Telephone Co. shows that the arbitration and liquidation expenses amounted to 1.32 per cent. of the sum realised. (Page 375.)

OUR Trade Section contains descriptions of an electric cooking stove and a commutator grinder. (Page 376.)

EXTENSIONS of generating plant are contemplated at Oldham and Rawtenstall, and a wet air filter is required at Rochdale.—A loan of £74,850 is being applied for at Walsall for a new electricity works. (Page 377.)

NEW supply schemes are under consideration at East Grinstead and Truro.—Profits are reported on the electricity undertakings at Lynn, Middlesbrough, Rugby, and Shrewsbury. (Page 378.)

THE General Electric Co. reports a trading profit of £157,898; a ten per cent. dividend is recommended.—The liquidation of the Consolidated Diesel Manufactures Co. is under consideration. (Page 378.)

THE Ilford Gas Co. is taking proceedings in the Chancery Division against the Ilford U.D.C. with regard to dealings in electrical fittings, and also the charges for power supply. It is alleged that in the first case money is being spent illegally, and in the second that preferential treatment is being given. (Page 378.)

THERE is a strike of electric wiremen at Liverpool. The answer to the wiremen's demands has been a reduction in wages. (Page 378.)

### ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JUNE 25TH.

*Institution of Electrical Engineers.*

9 p.m. Conversazione at Natural History Museum, Cromwell Road, S.W.

TUESDAY, JUNE 30TH.

*Wireless Society of London.*

8 p.m. At Institution of Electrical Engineers. "The Production of Continuous Waves by High-frequency Dynamo Machines," by Basil Binyon.

THURSDAY, JULY 2ND.

*Institution of Civil Engineers.*

8.30 p.m. Annual Conversazione at Great George Street, S.W.

### The London Electrical Engineers.

Headquarters (46 Regency Street, S.W.), open Sats. till noon. Rating Exam. for all Co.'s from 7 to 8.30 p.m. on Wednesday. (TO-DAY) THURSDAY, JUNE 25TH, C. Co., FRIDAY, JUNE 26TH, D. Co., SATURDAY, JUNE 27TH. Main body for Berehaven Camp parade Headquarters 12 noon.

### THE KRIEGER CAR'S RUN TO BIRMINGHAM AND BACK

A VERY successful trip from London to Birmingham and back was accomplished by the Krieger electric landaulette, which is equipped with a Naylor battery, in connection with the vehicle demonstration at the Birmingham Convention. The party of three started from the City at 6.40 a.m. on Monday, and the steady rise up the Finchley Road was taken at an average speed of 14½ m.p.h., the first stop being at St. Albans at 8.10, where Mr. Pauling of the Krieger Carriage Syndicate was picked up. The carriage then proceeded to Bedford, which it reached at 10.15. Here a stay was made, and the travellers partook of a much-needed breakfast, whilst the battery was given a charge of 206 amp.-hrs. The journey, which was continued at 12.59 p.m. from Bedford, through Northampton provided several opportunities of testing the capabilities of the car as a hill-climber, the most noticeable gradient being at Hill Norton, which was climbed at a speed of 10 m.p.h., with the battery yielding 130 amps. at 85 volts. A fresh charge of 200 amp.-hrs. was taken at the B.T.-H. Co.'s works at Rugby, and during the run down to Birmingham, which was reached at 8.23 p.m., the figure of 35 m.p.h. was attained on the gradient near Stonebridge. The following day the carriage was taken to Witton without any further charging, and in view of this fact it is worthy of mention that a speed of 35 m.p.h. was again attained on the Parade Ground. On Wednesday, after a battery charge of 183 amp.-hrs., the return journey was commenced at 3.0 p.m. The hill at Stonebridge proved less welcome now than on Monday, as it reduced the speed to 10 m.p.h., whilst the current rose to 115 amps. The B.T.-H. works were safely reached at 5.0 p.m., and another charge of 187 amp.-hrs. was taken, and the hilly road through Northampton to Bedford negotiated without any mishap. Next morning the battery was replenished after its duties of the preceding day by a charge of 200 amp.-hrs., and the journey was continued.

Leaving Bedford at 11.25 a.m. on Thursday, the car proceeded gaily along, only slackening pace at Luton Hill, where the current demand rose to 120 amps. at 85 volts for a short period, and reached Gillingham St. at 8.15 on Thursday afternoon.

### SIR JOHN SNELL

A GREAT honour has been done to the electrical engineering profession as represented by the Institution of Electrical Engineers by the conferring of a knighthood on its President-Elect, Mr. John Francis Claverton Snell, as well as to the recipient of the honour personally.

Mr. Snell, whose portrait we reproduce, rose to be President of the Institution very quickly, having been only elected Vice-President in 1911. He was on the Council first in 1909. He is a member of the firm of Consulting Engineers



of Preece, Cardew, and Snell, which he joined not long after resigning his position as Chief Electrical Engineer to the Sunderland Corporation in 1906, which he had held for ten years. He has been on more than one occasion prominently connected with Parliamentary work in the preparation of large electric supply schemes, acted on behalf of the London County Council in connection with the famous power Bills of 1905 and 1907, and was the leading expert for the Post Office in the arbitration proceedings concerning the sale of the National Telephone Co.'s business. Before going to Sunderland he was Resident Engineer to the St. Pancras Electricity Undertaking, and in earlier days was assistant to the late Major-General Webber.

### ELECTRIC POWER AT THE NEW HULL DOCKS

THE new Joint Dock of the North Eastern and the Hull and Barnsley Railways, which will be opened by the King to-morrow, involves a water area of 53 acres and a total length of quay of 8,162 ft., and is provided with an equipment worked entirely by electric power. No steam-power plant is installed, and the whole of the energy required will be supplied at 440 volts D.C. from the Corporation of Hull electricity works. Although the lock and graving dock gates and certain of the coal tips are actuated hydraulically, the whole of this plant is worked by electrically-driven pressure pumps.

The coaling appliances, which have a total capacity of 5,000 tons per hour, consist of five electric belt conveyors of a capacity of 800 tons per hour each, of which two are now being erected, in addition to two hydraulic hoists for 500 tons per hour. There are in all fifty-two electric cranes, comprising nine 10-ton cranes, four 7-ton cranes, thirty 3-ton cranes on the quay side, and nine 1½-ton travelling cranes on the roofs of the various warehouses. In the grain site, which is under construction, there will be eight underground electric belt conveyors, with a capacity of 120 tons per hour each, and six portable elevators, besides other electrically-driven appliances. The quay cranes will all travel on rails with a 15-ft. gauge, and have luffing jibs; six of the 10-ton cranes are fitted with portable elevators for discharging grain. The warehouse cranes are also fitted with special luffing gear.

It may be mentioned that the electric cranes were supplied some by Royce, Ltd. (Manchester), and some by Craven Brothers (Manchester). Electric capstans and other gear were supplied by Sir W. G. Armstrong, Whitworth & Co. (Newcastle). Other important contractors for the electrical portion of the work include:—Callender's Cable & Construction Co. (cables), The British Westinghouse Co. (switchgear), Crompton & Co. (arc lighting), W. Taylor & Co., Hull, and Falconer, Cross & Co., Newcastle (wiring), and Chamberlain & Hookham (meters).

## ANNUAL CONVENTION OF THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION

### BOILER HOUSE EQUIPMENT

IN our last issue we reported the proceedings up to mid-day on Wednesday, including a summary, sent by telegraph, of the discussion on Mr. Fedden's Paper on boiler house equipment on Wednesday morning. We give below a fuller report of this discussion:—

MR. W. W. LACKIE (Chief Electrical Engineer, Glasgow) said that after a visit to some of the largest electricity undertakings in Canada and the United States last year, he had come to the conclusion that the modern boiler house was no longer a stokehold, but a boiler room, in the same sense as we now have an engine or turbine room, with ample natural light, and a minimum of dirt. The building should be at least of three storeys; the ash- and soot-handling plant should be on the ground floor; the first floor should contain the boilers proper; and economisers should be on the upper floor. His experience was that the larger the boiler unit one could obtain, the better. Until recently they had been accustomed to boiler units with a little over 4,000 sq. ft. heating surface, but, for sudden clouds, &c., it was very comforting to have one or two boilers of 8,000 or 9,000 sq. ft. heating surface available with steam up. They had found such boilers more efficient, and one man could look after a combination of such boilers as easily as he could look after the same number of smaller boilers. They had proved recently in Glasgow that nothing but steel should be used in steam pipe lines. The crown head valve on a boiler burst while the boiler was in commission, and if another valve had not been in series with the faulty one, serious consequences would have resulted. The Board of Trade inspector, after a thorough investigation, came to the conclusion that the trouble had been entirely due to superheat, and that steel was the only adequate safeguard. Bottom-emptying trucks, referred to by Mr. Fedden, were practically unobtainable in Scotland. Coal-measuring chambers had been found by them to be unreliable, and they used nothing but automatic weighing machines, one to each boiler. A few steam-driven auxiliaries, he continued, do away with the necessity of live steam feed-water heaters. On the question of coal storage he was of opinion that at least two months' stock should always be on hand, with such storage accommodation that uniform deliveries could be taken all the year through, and if anything a larger supply during the summer months. The modern boiler house should be equipped with instruments to show the amount of coal burned, the water evaporated, the steam passing to the generating plant, the draught, and in every way to have an equipment equivalent to the switchboard instruments in the engine room. Five years ago, at the time of the great trade depression, they realised in Glasgow that their coal consumption per unit was much higher than it should be, and immediately set about installing a considerable number of indicating instruments. These, along with special tests which were carried out, resulted in a saving in the coal bill for the year of some £10,000—practically 20 per cent. of the total cost—and yet it could not be said that there had not been reasonable care in the boiler house previously. The wear and tear of bucket conveyors for the removal of ashes was so great that these conveyors were being abandoned, and a suction ash plant had replaced them with most satisfactory results for the last six months. The cost of operating the suction ash plant worked out at about 5 units per ton—against which must be set the reduced cost of maintenance on moving plant and better conditions for the men. He noticed that Mr. Fedden recommended the combustion rate of 25 lb. per hr. per sq. ft. of grate area in boilers. In a recent test he had taken, four hand-fired boilers supply a 5,000-h.p. turbine, and burned coal at 30½ lb. per sq. ft., and generated 21,600 units. The lbs. of coal per unit were 3.41. He put on another boiler, making five, and reduced the coal burned to 21 lb., and the lbs. of coal per unit were 3.03—a reduction of 5½ per cent.; the draught in both tests was 0.4 in. water gauge. During the winter months, at time of peak, it was advisable to press the boilers much higher than the above rates. The cost per kw.-hour should always be given as so many lbs. of coal per unit, and the calorific value of the coal stated, or, better still, the number of B.Th.U. per kw.-hour. With reference to the question of equipping the power station with by-product plant and firing the boilers with gas, it had been stated on good authority that with coal below 10s. per ton, it would pay to do this on something like 8 per cent. of the total plant with a 20 per cent. load-factor in the power house; but with coal above 10s. it would not pay, owing to the enormous capital cost and area of ground necessary. One of the objects of his visit to America was to see how they tackled emergency peak loads due to fog or black clouds, more especially in Chicago and New York. Although they had batteries which they could put on to the central area of the city, the major portion of their lighting was on A.C. supply. He was shown

the Taylor stoker, which had been fully tested, and responded to sudden demands in a most remarkable manner, and was so much impressed with it that on his return it was arranged that two of his boilers should be equipped with it. The stokers are put under boilers which normally evaporated 24,000 lb. of water per hour, and the manufacturers have guaranteed that when the fuel bed of the stoker is maintained in a live banked condition, an interval of not more than 10 minutes would be required to bring the boiler up to the rate of steaming corresponding to an evaporation of 24,000 lb. per hour, and in an additional five minutes to 46,000 lb. The combined efficiency at 24,000 lb. is 72 per cent.; and the stoker should be capable of burning sufficient coal to evaporate a maximum of 58,000 lb. of water per hour. It was not their intention to run the boilers at these high rates for any length of time, but only to give sufficient time to get other boilers under way. In Glasgow and other large cities they were troubled with this question of sudden demands, especially during the summer, when a considerable number of the boilers were out for survey. In America he had also seen steam meters made by the General Electric Co. of America, and by the B.T.-H. Co. in this country. One of these meters was fixed on a boiler tested recently at Glasgow, and the indications were so satisfactory when compared with the measured water in the tanks that they were now equipping each boiler with a steam meter, the same as an ammeter on a generator. In Glasgow the cost of keeping banked boilers to meet sudden darkness was £5,000 a year. Mr. Fedden had mentioned 15s. per ton of coal stored as being the cost of the coal-handling plant. He (Mr. Lackie) had recently been looking into this question, and he had quotations which led him to think that stacking at the height at which they could do with Scotch coal, 7s. 6d. per ton gave an ample margin.

MR. J. W. BEAUCHAMP (Chief Electrical Engineer, West Ham) said that in most cities there was no market for ashes, and it was necessary to obtain a tip or to have them taken away. In London everybody paid a considerable sum; in some places as much as 2s. 6d. per ton was charged for barging the ashes to the lower reaches of the river. If the ashes were sold at the door, so to speak, the cost varied directly with the tonnage, but if one bought land and dealt with them by means of machinery, the cost consisted of two items: a fixed charge on the capital, and the small running charge. In the latter case the cost of ash removal dropped very much as the quantity increased. He had a suction ash plant which had not been working for a sufficient length of time to obtain any precise costs, but as far as he could see, the capital charges for the removal of 10,000 tons of ashes per annum from the ash tunnel to the slip where they were transported by barge or cart would come out to about 7d. per ton, and the electrical energy 2d. That 7d., however, would become 3½d. if the quantity of ashes were doubled. He had had one of these plants running for eight or nine months, and so far as he could see it was quite the most practicable way of removing the ashes. He used the pattern with a Roots exhauster, and no difficulty had been found with regard to repairs or erosion of pipes except at bends, where it was easy to replace them. The only difficulty found so far was with regard to the emission of dust, which depended upon the quality of coal used. This difficulty was being dealt with by the makers, who were putting in a separator. It might also be dealt with by using wet screens, as used for cleaning the air of buildings. The dust did not occur in the ash tunnel (the conditions in which were very much better than they were before), but when the air was blown out from the exhauster. One firm making this class of plant, he understood, was erecting a return pipe from the exhauster back to the hoppers, where the ashes enter the main conveyal pipe, to deal with surplus air drawn in at each opening where the ash enters. That reduced the load on the blower motor, and got rid of the dust difficulty to a very considerable extent. Where the clinker was hard he found it necessary to use a crusher. There were one or two minor disadvantages to the erection of the economisers above the boilers, neither of which, however, were sufficient to affect a big station. It was difficult to keep them full of water when the boiler was standing, so that there was a delay, when starting the feed pumps, before water appeared in the boiler. Moreover, it seemed reasonable to anticipate that corrosion would take place in the economiser at the air and water level, and it would probably be found necessary to make special arrangements to keep the economiser plumb full of water when the boilers were standing. Mr. Fedden's figure of £1 per ton for reinforced concrete coal bunkers agreed with his own experience at West Ham. He believed the authorities were divided as to whether coal stacks should be ventilated or tightly sealed. One point upon which the author had not touched was the provision of air required for the consumption of fuel in the furnaces. This in large stations was of enormous volume, and whether natural or suction draught was used, this air was generally obtained from all sources—through doors, windows,



and other openings, and during the winter weather when there was a tendency to restrict openings to the outer air, very acute draughts might be produced. He believed some work had been done in the direction of leading the heated air from the engine-room into the boiler for this purpose, and it did seem to be scientific and natural method tending to keep the engine-room cool and to provide the boiler furnaces with air which had already been raised to a fair temperature in the process of cooling generators. Another point was the provision of adequate space for the steam arrangements. Modern practice tended to do without duplicate pipes, &c., but it was often found that although all the chief items of plant were laid out with regard to their several needs, the steam piping was left to wind its way about the station as best it could, dodging columns and climbing stairs after the manner of flexible cable. In a very large station one might be justified in providing the main header with a special large chamber running lengthways between the engine-room and boiler house. If the chamber were enclosed it would act as a supplementary lagging, and, furthermore, there would be an added protection in the event of any serious explosion in the boiler house.

Mr. C. H. WORDINGHAM (Admiralty), referring to the use of special trucks at Sheffield, said he was surprised that more use had not been made of the "tippler." He was putting in an arrangement of that kind for a central station for which he was responsible, and believed it would give excellent results. It got over the difficulty of having special trucks, and avoided the danger of damaging the railway companies' rolling stock. His ideals as to merging the interests of gas and electric supply might not be very popular, but he thought that the position might be altered materially by the new system of combustion known as surface combustion, in which, instead of supplying the gas to the engine, it was supplied to the boiler, thus giving greatly increased efficiency, and a very large reduction in the size of the boiler, the latter enabling them to get steam-raising plant much more nearly of the same size as the steam turbine generating units.

Mr. W. C. P. TAPPER (Chief Electrical Engineer, Stepney) said that the author was fortunate in having a valley close by in which he could put his ashes, but in the part of London which he represented and which contained a population of 300,000 within an area of two square miles, it would be rather a difficulty to find such a valley into which to put his ashes. The £10 per kw. mentioned in the Paper for the capital expenditure on the whole station seemed so low that he could hardly think it included buildings and land as well as plant and machines. He was not at all sure that it was necessary to arrange the boilers at right angles to the engine room in order to get the necessary capacity; in Stepney he had found it possible to arrange the boilers parallel with the engine room for 5,000-kw. turbines. At Stepney also he had put a live steam feed heater into the hot well, and discharged the steam from the reciprocating pumps through the heater, thus retaining all the heat and discharging the oily contents of the water into the drain. He was now putting in a turbine-driven rotary feed pump, and the whole of the exhaust from this would be turned back into the hot well. He had been the first to instal the Prat induced draught system at Stepney, having put in four chimneys dealing with eight boilers. In that case the chimneys worked on what was called the cold blast system, and they had worked entirely satisfactorily. In the extensions at Stepney he was putting in the later type of Prat chimney with the in-circuit system, i.e., a fan draws a certain proportion of the boiler gases and passes them back under pressure into the chimney. The general arrangement would be a boiler with a travelling grate stoker and forced draught under the stoker and induced draught above it, thus giving a balanced draught on the bars, each boiler complete with its own chimney.

Mr. YORATH LEWIS (British Niclausse Boiler Co., Ltd.) invited the members to inspect the Britnic boiler equipment which had recently been installed at Southend. By this system of boilers he claimed that it was possible to evaporate anything from 150 to 200 lb. per hr. per sq. ft. of ground space occupied. Mr. Fedden had set out in the Paper what he considered to be the best combinations of plant available in this country to get what he considered to be the best overall efficiency and least maintenance cost. The second combination was indicated as likely to have the greater future presumably because it had been able to give an overload capacity of 65 per cent. for about an hour. There were many features of this equipment which he would like to discuss in detail, but he would only mention in passing the draught pressure of 3.3 in. required for working at normal load, and that to provide this, both induced and forced draught plants were required aggregating 85 h.p. He submitted that a superior combination could be presented of Britnic specialities throughout in units up to 60 or 70,000 lb. of steam per hour. The boiler would evaporate at 6.75 lb. at normal load, and 9½-10 lb. at 40 per cent. overload per sq. ft. of tube external heating surface. The superheaters would be located immediately above the boiler tubes. The steam temperature would be 600° at all loads without distress on long periods of working, and the steel tube economisers would be capable of being kept clean internally and externally. The gases would be discharged into the chimney at 360°. Low-pressure forced draught would be included

with mechanical stokers of liberal grate area capable of ready adjustments to burn any class of coal from the richest to the poorest, absolutely without smoke and with the least amount of excess air at any rate of adjustment between three-quarter load and 40 or 50 per cent. overload, for two or three hours without undue distress on the bars. There would also be low-pressure forced draught fans, situated in the basement under the firing floor, working with a low air pressure in the ash pit.

Mr. A. ATKINSON (Clarke, Chapman & Co.) advocated the use of the Wodson boiler made by his firm.

Mr. G. D. SEATON (Richardsons, Westgarth & Co.) insisted that plant should be tested by an independent engineer to ascertain whether it came up to its steam guarantees.

Mr. R. U. BAILEY (Resident Engineer, Summer Lane, Birmingham) favoured the use of steam auxiliaries. In the event of an interruption to the supply, the motor-driven auxiliaries at once failed, and this, of course, greatly complicated the restoration of supply. He also thought that the small steam plant was less liable to breakdown than motors when continuous running was necessary, and the employment of exhaust steam for feed heating purposes gave a very high economic result as the latent heat of the steam returned to the boilers. Mr. Fedden had stated that when burning 25 lbs. of rough engine slack per sq. ft. of grate area, 5.25 lbs. of water would be evaporated per sq. ft. of heating surface. This amount of coal per square foot of grate area was exceedingly low for such high evaporation. In general practice he thought 32 lbs. per sq. ft. was more likely to be obtained when working a water-tube boiler at its rated normal capacity. The figure of 5.25 lbs. of water evaporated per square foot of heating surface was exceptionally high, as, in applying this duty to a standard 43,000 lb. per hour Babcock boiler for comparative purposes, the duty would be 32,455 lbs. per hour from and at 212° F., which was 35.5 per cent. over duty. He therefore did not think that these figures were consistent with conditions obtained in common practice. Mr. Fedden had given a further set of figures relating to the duty obtained with the underfeed stoker, and it was intensely interesting to find that the boiler duty could be increased 65 per cent. above normal. It was very unfortunate that Mr. Fedden had not given the thermal value of the fuel used nor the lbs. of water evaporated per lb. of coal, so that an idea might be formed as to the thermal efficiency of the boiler working under these conditions. Mr. Fedden had enumerated the difficulties which existed with chain-grate stokers, and undoubtedly when burning a fine slack the handling of the riddlings was a matter which had to be taken seriously into consideration, as this amount was, he thought, between 3 and 4 per cent. of the total coal passed over the stoker. These riddlings had a very much reduced calorific value as compared with the main fuel, due to the volatile matter being small, but they had a high carbon value. The general practice was, he believed, to throw these riddlings periodically back again into the hoppers, but this had the effect of spoiling the fires and upsetting uniform combustion. At Summer Lane station two underfeed stokers were employed almost entirely burning these riddlings, and it was found that this method was highly economical. It would, of course, be impossible to use a chain-grate stoker entirely for this class of fuel, as having practically no volatile value there would be little or no flame, consequently the temperature of the arches would be below that necessary for igniting the fuel. In connection with storage of coal, Mr. Fedden had omitted to state the most important point of all, viz., that it was undoubtedly the presence of sulphur in coal which occasioned spontaneous combustion; the sulphur, which was usually present in the form of iron pyrites, readily disintegrated, and caused heat to be generated. Coals free from sulphur might be stacked with a certain amount of latitude. At Birmingham they were at present carrying a stock of 10,000 tons, the largest heap being 4,000 tons. This coal stock was made up of 3-in. nuts at the base, and graded through the various sizes of nuts to shallow screenings at the top. The depth of the stack was 12 ft. The object of this grading was to allow any local heat which might be generated to be readily dispersed through the interstices of the coal. The chance of firing was, of course, greater at the base, due to the weight of the coal above. A smaller heap made in this way, containing 1,500 tons, had been down for about three years, and they had up to the present been unable to detect any appreciable rise in temperature above that of the atmosphere. They also had a still smaller stack of 700 tons which had been standing for about six years, the heap consisting entirely of nutty screenings, and to-day practically showed as high a calorific value as when put down, the crust only being weathered. This latter stack was put down at the same time as other stacks of coal drawn from other collieries, which readily gave trouble owing to spontaneous combustion, and they had since found by analyses that the coal standing to-day was the only coal free from sulphur. He noticed that Mr. Fedden had purchased his coal to a rigid specification, and that any coal which was found to be at all below the calorific value specified had its price reduced proportionately. This latter point he did not think at all satisfactory, as coal people were apt to take advantage of this, and dump upon one coal for which they could not find a market and which was cheap at any price to be rid of. Mr. Bailey further

recommended that a record of the calorific value of the coal used should be included in the weekly cost sheets, so that the B.-Th.U's per kw. hr. could be noted and expressed as the "percentage thermal efficiency of the station."

Mr. W. R. WOOD (Underfeed Stoker Co.) gave the results of some tests in which the evaporation was 8½ lb. per hr. per sq. ft. of heating surface; the escaped gas in the boiler had a temperature of 530 deg., and the escaped gas in the economisers had a temperature of 310 deg., whilst the efficiency was approximately 85 per cent. From this he maintained it could be argued that high rates of combustion under proper conditions did not reduce the efficiency of a boiler plant. Mr. Lackie had pointed out that with four boilers working at 30 lb. of coal per sq. ft. of heating surface the efficiency was lower than with five boilers working at 25 lb. Mr. Lackie had, however, introduced another factor, viz., the increased heating surface, and he would like to know whether Mr. Lackie attributed the falling-off in efficiency at higher rates of combustion to imperfect combustion or to the difference in the heating surface.

Mr. J. K. BRYDGES (Chief Electrical Engineer, Eastbourne) said that it would have been preferable if the engineers had stated their difficulties first, and that the manufacturers' representatives should have followed them in the discussion, to explain why the difficulties had occurred. With reference to live steam feed heaters, he suggested that the increase of temperature mentioned by Mr. Fedden could have been produced entirely with the feed pump exhaust. He believed there was at hand an apparatus for pre-heating the air before it got into the boilers. It had merely to be put into the flue so that the only cost was a small capital outlay. He was contemplating putting down more boilers, and would like to hear the experiences with these pre-heaters; he believed Mr. Bowden, of Poplar, had one. It had been suggested that the pre-heating of the air caused excessive burning of the grate bars, and that it also necessarily meant there must be a closed ash pit or loss of air carried to the grate. He had found it absolutely impossible to store slack coal in heaps of more than about 8 ft. deep, although his bunkers were 21 ft. deep. He now used pea coal, and although it contained sulphur, he could stock this coal 18 ft. deep. He had fitted tubes through which he could drop thermometers, and had not found the rise of temperature to be more than 10 to 12 deg. He agreed with those speakers who thought an evaporation of 25 lb. per hour per sq. ft. of heating surface was plenty. A higher rate might do with a vertical tube boiler, but not out of a B. & W., without trouble with the hog tubes at such a high duty. The cleaning of horizontal tube boilers was very expensive, because nowadays when the inspector came round he wanted every cap taken off every tube. With a vertical tube boiler, however, it was possible to get at all the tubes with very little trouble indeed. The only difficulty with a curved tube boiler was that the inspector wanted a ball dropped down every tube. He kept two balls, one slightly smaller than the other, for this purpose. He had found that the length of time for cleaning a boiler varied from ten days to three weeks, according to the type, and this should be considered in putting in new boilers.

Mr. F. AXTON (Chief Electrical Engineer, Ipswich) asked if any members had had experience in getting rid of ashes by means of the water-pipe system similar to that used for the ejection of ashes at sea. This might get rid of the dust difficulty. When using natural draught it might be an advantage to arrange the openings on the four cardinal sides of the boiler house so as to get the maximum effect by opening them on the side where the wind was blowing. As to storing coal, he used Nottinghamshire slack and stored in heaps not less than 12 ft. deep, and had never had any trouble with firing. The coal, however, was not strong in sulphur content. He was always having trouble with the links of B. & W. chain-grate stokers; the small projection on the side of each link, to fit into the space between the adjacent two links, burned off in a very short time. At Ipswich he was trying a bonus system for economy of coal in the boiler house. A value for the coal costs was fixed for each quarter and the bonus was given for all coal consumption which improved it. The bonus was distributed among the firemen, trimmers, drivers, switchboard attendants, and the shift engineers.

Mr. R. HAMMOND said that he had recently been for some months in South Africa, and had examined the large new power station of the Transvaal Power Co. at Vereeniging, which would ultimately have a capacity of 80,000 kw. When he first saw it he thought the works were not in operation, but subsequently found out that although they were burning 1,000 tons of coal per day there was not the slightest amount of smoke to be seen coming out of the chimneys. That was his testimony of what was actually being done with the Prat system, and if Mr. Fedden's station worked with the same efficiency he was not surprised that he had got the costs to so low a point as was seen by the Paper.

Mr. S. UTTING (who represents the Prat system in this country) said he was very pleased to see that Mr. Fedden had come to the conclusion that 25 lbs. per square ft. of grate area was a good figure. There were, however, times when that figure could not be upheld, and when higher rates of combustion must be adopted, which meant more active draught. Mr. Fedden had given the results of some of his tests, and said

that the out-going gases to the chimney were at 300° F. There were frequently, in central station work in England, cases in which the gases were at 240—300° F., and there were several central stations on the Continent where they were getting even lower. To get this with natural draught would need a chimney 400 or 450 feet high. Mr. Tapper was the first central station engineer in this country who had experience of the Prat system by which cold air was injected into the chimney in order to induce the flow of the main current. Nine or ten years ago Prat developed another means whereby he used the main flow of the gases in order to create this induction. Such a plant had actually been designed for Birmingham, and had been working for some time. Mr. Prat could tell them that if with his most efficient "out of circuit" system 100 units were required, then his "in-circuit" system would take 75 units. If it were dealing with cold air it was necessary to deal with the main product of combustion representing 100 per cent., plus the cold air required for injection, which was no small amount, and consequently the apparatus must be bigger. In the Tramways Department in Sheffield this plant was working on two boilers, with a similar arrangement to that now adopted by Mr. Fedden; the boilers were side by side, and had 30,000 lbs. per hour normal evaporation. From some test figures he had, it would be seen that the load corresponded to about 7 per cent. over-load. The plant was burning 6,420 lbs. of coal per hour, and there was only an induced draught fan, no forced draught, and the simple Prat "in-circuit" system, the h.p. on the fan being 21. The plant at Birmingham was tested three or four weeks ago, and the average of three tests worked out at 9,600 lbs. of coal per hour; the average draught was from 31 to 33 mm., and the h.p. was 35. That did not compare very unfavourably with Mr. Fedden's figures, and it constituted an admirable arrangement where the rate of combustion per sq. ft. of grate surface must be for ordinary conditions something in the neighbourhood of 30 to 35 lbs. per sq. ft. or more.

Alderman Dr. H. GERVIS (Brighton) said he thoroughly, absolutely, and entirely agreed with Mr. Fedden as to the employment of highly-trained technical men, but it was the most difficult thing to do to convince a council—at least it was so in the South of England—where the democracy was most unwilling to pay for brains. As Chairman of the Brighton Lighting Committee, he could say that his Council would, as a rule, pass large sums for plant and apparatus with three minutes' discussion, but if he wanted a rise of salary of a few shillings for a highly scientific and skilful employee it meant two hours of acrimonious debate.

Dr. S. Z. DE FERRANTI, speaking first with regard to air heating for boiler fires, said that theoretically it was perfectly right to heat the air for combustion under the boiler, but in practice little satisfaction had been obtained from this process. The plant was invariably put in too small, and the result was that instead of the air being properly heated up to a fair equivalent of the temperature of the outgoing gases, a very poor result was obtained. With only a moderate efficiency from the plant, however, there had been very great trouble with fire-bars, which with hand-stoking had stood, but with various forms of mechanical stokers there had been nothing but trouble. A fire-grate depended for its existence upon the lowering of the temperature of the bars by the incoming cold air. Slagging appeared to be the worst trouble, and the surface of the bar was eaten away.

Mr. W. M. SELVEY (Sheffield) said that at present coal-buying was left largely to the coal broker, and it had always been a grievance of the engineer that he had no voice in buying coal. The real reason why engineers had no voice in this was that they could not sample the coal. It would be necessary more and more in the future to keep boilers at right angles to the engine-room, to make these boilers even bigger, and to put the economiser on top of the boiler to fill the whole of the available space that there was on the ground plan of the boiler. Even with this they would have serious difficulties in keeping the boiler house alongside 20,000 kw.-units. The question of the boiler house in this respect was entirely one of the stoker. The size of boilers had not increased; in other words, they had rested by the way, and now that it was time to move it was found necessary to go to America for stokers. Although the Taylor stoker was quite good, however, he regarded it only as a passing phase. Two things were wanted: first, a perforated platform to support the coal; and, secondly, a means of driving this platform. Developments in this direction had already been made, and particularly in the direction of separating the function of the platform from the function of the driver, and this tended to make the arrangement flexible in the same way as the governor made a turbine flexible. Finally, with regard to gas-making, he would like to point out that the bulk of coal was carbon. When electrical engineers could assist the gas industry by using boilers in which gas coke could be used efficiently, then it would be time to think about whether they could do anything in conjunction.

Mr. S. E. FEDDEN was unable to reply to the discussion owing to the shortness of time.

After being entertained at luncheon by the Coventry Corporation, the members visited the various works

on the programme, the majority of them going to the Daimler Motor-Car Works and the Coventry Electricity Works, both described in our issue of June 11th. Others proceeded to Rugby to view the Willans or the B.T.-H. Works. A description of the former also appeared in our issue of June 11th.

### THE RUGBY WORKS OF THE BRITISH THOMSON-HOUSTON CO.

The works at Rugby of the B.T.-H. Co. were visited by a party of fifty-seven.

The erection of the works was commenced in 1900. The present works occupy a site of some 39½ acres, and consist of

design of B.T.-H. apparatus, it is only possible to mention here a few of the most important of the company's manufactures. The Curtis turbine which has been built at Rugby since 1904 is well known as exemplifying all that is best in the impulse type. They are made for capacities of about 40 h.p. and upwards, both for high pressure and mixed pressure. The company's motors, both for direct- and alternating-current circuits, are stocked for all ordinary voltages and in the sizes most in demand. They are famed for their simple robust construction and reliability. B.T.-H. rotary converters are built for capacities up to 3,000 kw. for any standard voltage up to 1,500 volts D.C. on 25 cycles, and 750 volts D.C. on 50 cycles. They are of liberal design, and are suitable for reactance, booster, or induction regulator control. The company has also patented a two-part split-pole method of controlling the voltage ratio on their 25-cycle machines, which is free from the defects inherent in the three-part pole system, and has met with great success wherever installed. A large number of different types of con-

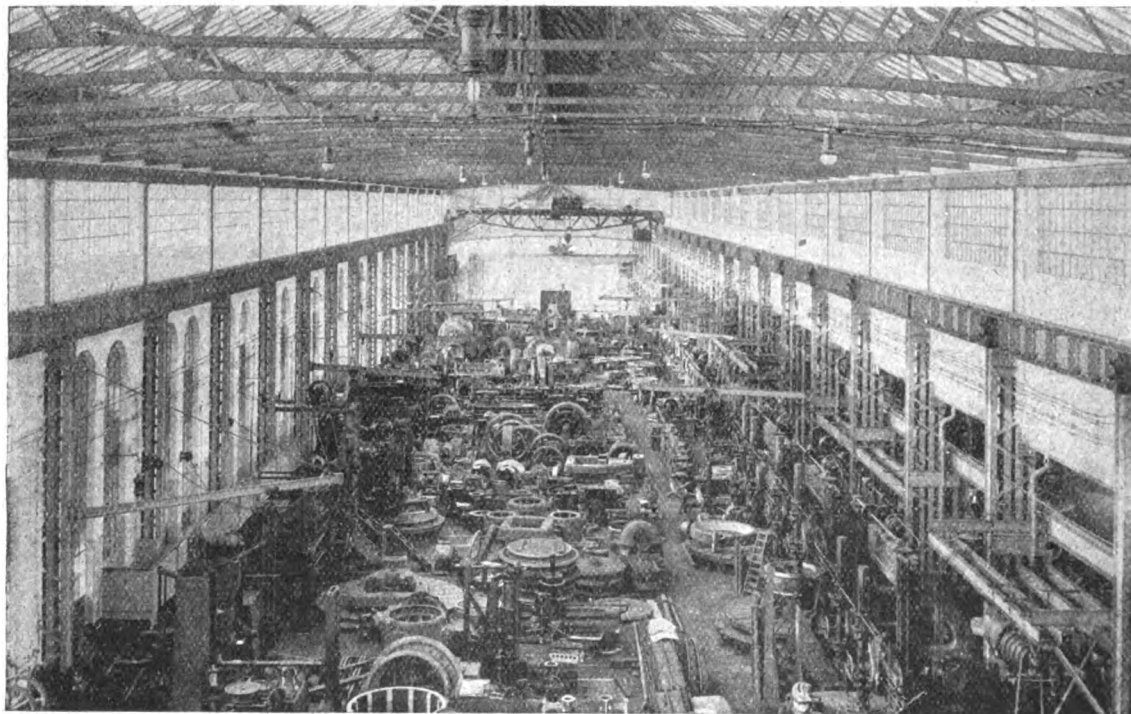


FIG. 1.—TURBINE SHOP AT B.T.-H. WORKS, RUGBY.

72 buildings covering a total ground area of 477,174 sq. ft., with a total floor space of 800,000 sq. ft. Sidings are provided connecting with the London and North Western and Midland Railways, and the handling of material in the works yard is taken care of by a locomotive and two travelling cranes, while light shunting is provided for by electric capstans. A 40-ton electric lift is provided to transfer loaded trucks to and from one of the buildings, which is at a lower level than the rest of the works. Material inside the buildings is handled by electric cranes with capacities up to 40 tons; a comprehensive narrow-gauge railway system also connects all parts of the works. The fire extinguishing equipment is very complete, and patterns are stored in a special fireproof building.

The heating of the buildings is mostly on the hot-air blower system, air being drawn in from outside, passed over steam heated coils, and distributed throughout the buildings.

The machine-tool equipment is thoroughly up to date, consisting chiefly of English makes, with some American and Continental machines, all of which, with the exception of a few pneumatic and hydraulic machines, are electrically worked. A large number are driven by individual continuous-current motors, the small machines being grouped and run from short lines of shafting. Power is obtained from the company's own power house, which contains plant aggregating 4,760 kw., the machines installed ranging from slow-speed reciprocating sets to high-speed turbo-generators. The thorough testing and inspection of all apparatus in the finished state, and in the various stages of manufacture, is a special feature to which a great deal of attention is given. The company has also factories at Willesden and Coventry, to which their switchgear and electrical instrument factories respectively have been removed. The Coventry works also take care of the manufacture of electrical heating and cooking apparatus. The company's employees number nearly 6,000, of whom 4,013 are employed in the Rugby works and offices.

Although many distinguishing features are embodied in the

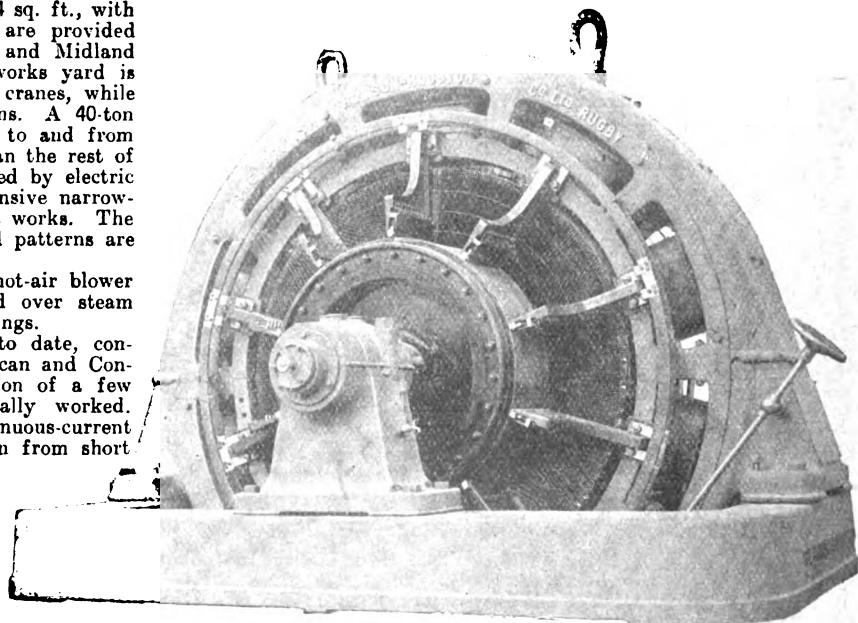


FIG. 2.—1,500-KW. 25-CYCLE 300-R.P.M. 600-VOLTS COMPOUND-WOUND INTERPOLE ROTARY CONVERTER FOR L. & S.W.R.

trollers are manufactured by the B.T.-H. Co., suitable for traction, haulage, machine tools, printing presses, &c. In addition to the numerous hand-operated controllers, the company manufactures many automatic starting and regulating equipments for

use with all types of A.C. and D.C. motors operating under the most arduous conditions. One of the best-known products of the B.T.-H. Co. is, of course, the Mazda drawn wire tungsten lamp, which was introduced by the company in 1911, and the more recently introduced nitrogen-filled "half-watt" lamps.

The visitors commenced their tour of the works by an inspection of the assembly department, where they were shown direct-current and alternating-current induction motors of the "Three in One" type. This is a recent development of the B.T.-H. motor design, whereby a single motor can be converted from protected to enclosed ventilated or drip-proof types by simply adding suitable covers. They proceeded to the turbine erecting and testing shop illustrated in Fig. 1 and saw 48 turbo-generator sets, ranging in size from 33 kw. to 6,000 kw. in various stages of construction. The machines on test in this shop included a 3,000-kw. turbo-alternator, a 2,000-kw. alternator for Kawasaki, a 1,000-kw. single-phase turbo-alternator for Bournemouth and Poole, a 300-kw. D.C. turbo-generator and a 100-kw. turbo-generator for the City and Guilds Institute, and a blower driven by a direct-current motor running at 3,000 r.p.m. Two 750-kw. rotary converters for the L. & N.W. Rly. were also on test, as well as two 1,500-kw. rotary converters for the L. & S.W. Rly. The number of these machines at present going through the shops amounts to 87, including 18 1,500-kw., nine 1,200-kw., 31 1,000-kw., and 29 750-kw. In another shop a large number of railway motors for the Central Argentine Railway were seen. There are over 200 of these motors, each of 250-h.p. capacity, at present going through the shops. A visit was also paid to the controller and rheostat factory, where a complete line of hand-operated rheostats, and a large motor-operated rheostat were seen, together with a complete line of B.T.-H. crane, mining, and tramway controllers. A new line of protected and totally enclosed starting rheostats, and an experimental train control equipment are also on view. The visitors then proceeded to the lamp factory, where they were shown the various processes in the manufacture of Mazda drawn wire and half-watt lamps.

### THE B.T.-H. METER WORKS

It is to be regretted that only five members and visitors availed themselves of the opportunity to visit the meter works at Coventry, as although in size they cannot compare either with the Daimler, the B.T.-H. Rugby works, or the Willans works, there was much of interest to see there. The works, which were started about two years ago, were previously the Humber cycle works. They are in three buildings, and are arranged for the accommodation of 1,500 employees.

In the manufacture of the D.C. meter, the copper cup is turned from a bar of electrolytic copper, and then finished on a special lathe of smaller type. It is then amalgamated and treated by a special process, which ensures that it is absolutely pure, as in the B.T.-H. meter the whole of the cup, and not merely the edge, is amalgamated, and is in contact with the mercury. The spindle is made in an automatic machine, which produces three complete spindles a minute, drills it either end, and hobs it. The hardened steel pivots are polished, examined under a microscope, and then fitted in the spindle, and the spindle is then fitted in the cup. The mercury chamber in which the cup revolves is made from drawn brass, turned out, and is nickel-plated to prevent the mercury from attacking it. The whole is then fitted together, the magnets screwed on, after which the magnets are magnetised with everything in position. This process of magnetising simply consists of hanging the magnets on a copper bar through which a current of 8,000 amperes is passing. The dials and cases are then fitted.

In the case of the A.C. meters the magnets have to be magnetised before the parts are assembled, and to "age" them they are afterwards placed with a copper disc rotating at 2,500 revs. per minute between the poles. An interesting feature in the manufacture of the A.C. meter is that the coils have no formers and no cheeks. A different machine is used for each size of wire, and the wire is simply wound on a metal former which is slipped out after winding. Paper is placed between each layer of wire. After winding, the coils are varnished and baked solid.

Besides meters, ammeters, voltmeters and wattmeters, relays, Tirrill regulators, the contactor gear for electric trains, heating and cooking apparatus (including electric irons), and arc lamps are made at these works, and speedometers for motor-cars also form a considerable portion of the works' output.

On Wednesday evening, after the return to Birmingham, the Lord Mayor and Lady Mayoress gave a reception and dance in the Council Chamber. The guests were subjected to a close scrutiny as they arrived by the Corporation officials, assisted by Mr. McArthur Butler, so that no suffragettes should be admitted, and the result was a most enjoyable evening.

On Thursday morning the Association proceeded to Stratford-on-Avon in motor char-a-bancs and motor buses, and after a welcome by the Mayor, Mr. Bowden's Paper (which follows, in abstract) was discussed.

### THE STANDARDIZATION OF TARIFFS

By J. HORACE BOWDEN (*Chief Electrical Engineer, Poplar*).

IF it were possible to so arrange tariffs as to produce an income exactly equivalent to expenditure, such tariffs, if conceived on equitable bases, would undoubtedly be ideal, but there are contingencies which prevent the consummation of the ideal, notably the fluctuations in the price of coal and maintenance of plant, buildings, and mains. It is practical to create a contingency fund in order to equalise these fluctuations over a period of years, but even if such a course were adopted the prudent manager must always provide a sufficient margin to show a surplus at the end of the period. The ultimate disposal of this sum should be at the discretion of the local Council, but as the amount should be comparatively small, and of little effect in reduction of rates, the author submits that a special fund be created from which the cost of special public improvements could be taken, which would be monumental of the benefit to the community of electricity undertakings apart from their legitimate sphere of public utility.

The author does not advocate the borrowing of money to supply cooking and heating appliances on hire; provision should be made out of revenue for any expenditure that may be necessary in this direction.

The Local Government Board now allows periods from twenty-five to fifteen years for the repayment of loans on account of mains, and the London County Council has fixed the maximum period at twenty-five years. Twelve and ten years are considered suitable periods for services and meters respectively. Why these bodies, in their wisdom, should have fixed these arbitrary periods is beyond the conception of the author. The law of continuity of supply renders it imperative that mains, services, and meters shall always be kept in a perfect state of efficiency, and there does not appear to be any valid reason why the extreme limit allowed by law for repayment of the loans for these purposes should not be granted, namely, sixty years.

#### The Tariff Ideal.

While it may be true that the laws of expediency govern private enterprise, it should never be lost sight of that Municipal enterprise is governed by the laws of equity. No argument, however specious, will alter the fact that it is inequitable to supply to one class of consumer at a loss which is to be recouped from another class.

The future practice in electricity supply is undoubtedly that which will enable an authority to assess an annual charge for declared requirements, irrespective of the purpose to which power may be applied, or to the extent that such power may be used. The present-day practice renders it essential that a secondary charge must be made in order to restrict unlimited use of power, for the sole reason that certain running costs are entailed in the production of electrical energy, although there is a possibility in the near future that these running costs will be entirely eliminated by the sale of by-products, &c., gas and coke products for steaming purposes, or for gas turbines or other gas-driven plant, and further revenue may be obtained from the sale of exhaust steam for heating, &c. It is in the interests of all concerned to standardise this secondary charge, and for this purpose the Association known as the "Point Fives" came into being. The charge of 0.5d. per unit carries with it, in modern undertakings, a sufficient margin over and above running cost to allow for fluctuations in price of coal, and provision against all contingencies such as breakdown of electrical machinery and failure of distributing and feeder cables.

#### The Norwich, or Rateable Value System.

No more pernicious system than the rateable value system for assessing the primary charge has ever been introduced into electricity practice. Its only attributes are those of expediency and simplicity in its application to domestic property. Apart from the insurmountable objection to this system raised by the fact that tenants in houses similarly assessed may make most divergent demands upon the resources of an undertaking, there are many serious obstacles to the attainment of permanent adoption.

Take the instance of property in a decadent area; as the value of property decreases the demand for electricity would naturally increase from the fact that originally in the possession of one family, it degenerates into tenements of several families.

Another instance is that of a tenant obtaining possession of property at a reduced rental because of installing electricity. One of the strongest arguments in favour of the supply is that the necessity for internal decoration of house property is con-



siderably lessened, and it is now quite practical for a tenant to make an agreement with a landlord not to require internal decorative work during a specified term of tenancy at a reduced rental.

The assessment on dwellings at and under £20 per annum is generally much lower than the better class, due to compounding by the landlords, yet this class of tenant will make a greater demand in proportion to rateable value than the possessor of a residence with a number of rooms, landings, and offices occasionally lighted.

Again, the working class is generally more prolific than the genteel class, and, having a greater number of mouths to feed, cooking operations are carried out at more frequent and irregular hours of the day, thus raising the diversity factor for their class.

In the Poplar area there are 3,259 houses rated over £20 per annum, and the author estimates that an average use of energy could be made by each tenant of 3,000 units per annum under present conditions of supply. But there are 19,866 houses rated at and under £20 each, having a prospective use of 1,000 units per annum under present conditions.

But when the case of the shop-keeping class is considered, there does not appear to be any justification whatever for the system. Shop rent is chiefly dependent upon environment, and premises in a main and important thoroughfare may command double the rent of similar premises in a street of minor importance, whereas the latter may require greater illuminating power than the former in order to attract attention.

The assessment of licensed premises is generally considerably greater than other business premises making a similar demand for light.

The application of the rateable value system to factories is perhaps more appropriate than to any other class of supply, and the rating officials would probably welcome an innovation whereby the horse-power installed would come directly under their notice, but it is doubtful if the consumer would duly appreciate a rise in rateable value consequent upon his increased demand for electrical power. It appears to be a curious fact that the only equitable application of the rateable value system would act as a deterrent to the adoption of electricity because, as a natural sequence to the installation of, say, an additional 100-h.p. motor, the Electricity Department would apply to the Rating Department to make an increased assessment on the property of that particular consumer. The strongest advocates of this system would strenuously oppose the application to factory supply, and but few would attempt to apply it to business supply of any description.

But apart from the inherent impracticability of rateable value as the basis of fixing a charge for universal supply, there is the objection of handing over to another department the onus of fixing the primary charge for electricity. It is only a natural sequence for that department to undertake the collection of such charges, and the engineer would then become subservient to the dictates of the Finance and Rating Departments, and his province is one of attending to his machinery alone. Once the element of business is eradicated from electricity supply, the present high status of the profession will be considerably lowered.

### Diversity Factors for Assessing Fixed Charges.

The accepted definition of the diversity factor in a supply of electrical energy is "the sum of the consumers' maximum demands, divided by the combined maximum demand upon the system." When energy was principally used for lighting purposes, this factor was of considerable importance, as by its use it was practical to fix the annual assessment, and divide it into a daily use of the consumers' maximum demand. Assuming that by dividing the standing costs of an undertaking by the maximum demand upon the system the cost was found to be £16 per kw., and the ascertained diversity factor was 1.5, and the selling price of energy 1d. per unit, then the charge to the consumer was  $(£16 \div 1.5 \times 365) \div 1d.$  per unit for one hour's use per day of each kilowatt of maximum demand, the result being 8d. per unit, all further use being charged at the selling price of 1d. per unit.

The maximum demand system became practically standard for lighting uses of electricity, but the great difficulty in explaining its operation to the consumer sufficed to act as a deterrent to progress, and, as a sacrifice to simplicity, departures were made by reducing the primary charge with a corresponding raising of the secondary charge, or by the institution of a flat-rate based upon average use. In this manner the inherent equity of the original system was nullified, and the consumers at once became divisible into "bad" and "good" from the supplier's point of view. As good consumers must of a necessity compensate for bad consumers in any solvent business, the cultivating of electricity supply became subject to the laws of expediency, and as progress has been made in power supply and more recently in heating and cooking and other uses of electricity, the

law of equity has apparently been more and more lost sight of.

It is to be expected at the hands of the administrators of the supply so to adjust tariffs as to conform with the laws of equity. This can best be done by studying the conditions of each class of supply in each individual area upon its own merits, and estimating the relationship of the demand for each class to the actual maximum demand upon the system.

Apart from public lighting, internal business lighting, and what is known as the 100 per cent. load factor power supply, all other demands are more or less subject to the application of diversity factors. In Poplar, which is an industrial area, the following scale has been adopted, viz.:—

Nature of Demand.	Diversity Factor.
Public Lighting ... ..	Unity.
Business Lighting, internal ... ..	Unity.
Business Lighting, external ... ..	1.2
Intermittent power ... ..	2
Domestic Lighting, general ... ..	2
Domestic Lighting, occasional ... ..	8
Cooking and Heating ... ..	20

The maximum demand occurs between 4.30 and 4.40 p.m.

**Public Lighting.**—At this particular period the whole of the public lamps are in lighting, and at first consideration a unity factor appears to be correct. But it must be taken into consideration that, in some of the streets, mains are laid from which little other demand than for public service is made, carrying with it capital and administrative charges; therefore a slightly higher charge has been considered admissible to cover this cost.

**Business Lighting.**—The charge is assessed on watts installed, it being assumed that all internal lighting will be in use at the period of maximum demand. It is not the usual business practice in Poplar to light up externally until later in the day, and by dividing the ascertained standing cost per kw. by 1.2 any discrepancy lies in favour of the undertaking.

**Intermittent Power.**—Every works of any importance installs a certain amount of power as stand-by both in regard to number and size of motors. As a general rule 75 per cent. of the total kilowatts installed may be taken as the normal load, and the diversity factor of two has been taken as the relationship of the normal load to the maximum demand, as it is generally found that motors are slackening down gradually from 3 p.m., therefore at 4.30 to 4.40 p.m. not more than one-half of the connected normal power load is likely to be in use at that time.

It has not come within the province of the Poplar undertaking to deal with any 100 per cent. load factor supply, but the author has no hesitation in stating that any tariff based on a greater diversity factor than unity, would not produce results equivalent to those obtained from an intermittent supply on the bases quoted.

**Domestic Lighting.**—A distinction has been drawn between general and occasional lighting. The demand has been assessed upon watts installed, and occasional lighting is generally understood to include bedrooms, cellars, offices and upper landings. In fixing the diversity factor at two for general lighting regard was had to the fact that under ordinary circumstances the whole supply would not be in use at 4.30 p.m. In purely residential areas it would perhaps be unwise to allow for this margin of diversity. For occasional lighting the factor of eight is not unreasonable, and certainly admits of many additional points being installed which otherwise would be left out.

**Cooking and Heating.**—For cooking and heating it is obviously unfair to make the assessment on watts installed. The cooking outfit in one residence may include heating elements that are not called into requisition for every-day use, whilst in another daily use may be given to all the elements comprising the outfit. The type of cooker also has some bearing upon the assessment; a rapid heater, although involving a greater demand, is used for shorter periods, and, therefore, the diversity is increased. However, there should be no difficulty in framing a scale to allow for these varying conditions.

In assuming a diversity factor of twenty, three peak times had to be considered. The daily power peaks occur at 11 a.m. and 3 p.m., as nearly as may be, and, by the lighting peak converging upon the power load, which produces the maximum demand, a third peak is created in early winter at 4.30 p.m. or thereabouts. It can be reasonably assumed that cooking operations will not commence until after 11 a.m., nor be continued after 2 p.m., and the acquisition of a load to fill the gap between 11 a.m. and 3 p.m. is most important. It may, however, be assumed that the demand will be felt at 4.30 p.m. when preparing afternoon tea and the workers' evening meal, but the loading required for the preparation of these meals is considerably less than for the mid-day meal. Taking everything into consideration, it is not unreasonable to assume that less than one-twentieth of the capacity of cookers installed will be in use at 4.30 p.m. on that particular day when the maximum demand occurs.

In dealing with this question, it has also to be borne in mind that the cooking load will almost invariably, in an

industrial area, be largely supplied through mains practically unaffected by the demand for power, therefore the additional load imposed upon the system will involve capital expenditure principally on plant and buildings.

The author submits that the price of electricity when in general use for lighting and cooking should not exceed 3d. per unit, competing with gas at 2s. 6d. per 1,000 cubic feet, or thereabouts. In fact, in order to beat gas competition out of the field, this price should permit of the inclusion of hire of cooker, heaters and installation, in order to encourage liberality of use necessary to ensure the supply being profitable.

Bearing in mind the bases of charges laid down in this paper, the following example will illustrate the position:—

A moderate-size residence of £26 per annum rateable value required a gas service for cooking and lighting costing approximately £10 per annum.

To replace this, twenty-two various lights and a 24 kw. cooking outfit were installed. The cost of the service, meter, and wiring installation was £20 5s. 4d., and the cooking outfit £8 10s. 8d. The total number of units supplied during twelve months was 3,128.

The annual assessment was, on the Poplar tariff, as follows, dividing £8 per kw. by the diversity factor in each case:—

0.552 kw. lighting at £4; 0.32 kw., occasional lighting at £1; and 2.4 kw. cooking at 8s., amounting to £2 14s. 7d. The cost of energy, 3,128 units at 0.5d., amounted to £6 10s. 4d., making a total charge of £9 4s. 11d., or 0.71d. per unit. The hire of the service (12½ per cent. on cost) amounted to £3 12s. 11d., bringing the total bill to £12 17s. 10d., or 0.99d. per unit.

It will be seen that the supply of energy alone compared favourably with the cost of gas, but in order to obtain the supply it was necessary to expend £28 16s., which, of course, must be expected to produce an adequate return.

The author has no hesitation in stating that for prudent reasons the annual charge on account of this expenditure is greater than the anticipated cost. The basis of ten years' life of service, meter, installation and cooker is undoubtedly too short, but regard was had to the accepted terms of ten and twelve years granted by sanctioning authorities for meters and services, and the unstable type of cooker then in the market. Promise is now given of a reliable cooker at a cost of £6, and experience shows that the average life of services will probably reach thirty years, and that twenty years may be presumed as the life of wiring installations and meters of first-rate workmanship. Furthermore, by dealing with this class of work on a greatly extended scale, the prime cost may be expected to be considerably reduced.

Viewing the situation from this standpoint, the service charges are amenable as follows, viz:—

	£	s.	d.
Service ... .. say 3	30	years	... 2 0
Meter and Installation ... .. 16	20	years	... 16 0
Cooker ... .. 6	10	years	... 12 0
Interest at 3½ per cent ... .. 25			17 6

Annual Charge ... .. £2 7 6

making a reduction of £1 5s. 5d. on present charges.

It is also anticipated that the fixed charge per annum will bear a reduction at an early date from £8 per kw. of maximum demand to £6 per kw., and that the diversity factor of two for general lighting may be equitably extended to three, which would halve the general lighting standing charge, and reduce the occasional lighting by 1s. 7d., and cooking by 5s., making a further reduction of £1 0s. 8d.

Taking the revised basis of charge, the following annual result is arrived at, viz:—

	£	s.	d.
Fixed Annual Charge ... ..	1	15	11
3,128 units at 0.5d. ... ..	6	10	4
Or 0.63d. per unit ... ..	8	4	3
Service Charges ... ..	2	7	6
Or 0.81d. per unit ... ..	10	11	9

at which price not only will the supply of energy compete successfully with gas, but the disability of competing with a rival power already in possession of the field will be removed.

### The Division of Costs Necessary in Determining Fixed and Running Charges.

In making an investigation of the varied costs which comprise the total cost of supply imposed upon an undertaking, it is necessary to dissect same under three distinct headings:—

First, the service cost, or the individual charge on the undertaking directly attributable to each consumer;

Secondly, the fixed cost, or the total sum necessary to carry on the undertaking, irrespective of the amount of energy supplied; and

Thirdly, the running cost, or the actual cost of supplying a unit of energy after making provision for service and fixed costs.

**Service Costs.**—It is now generally recognised that, in order to compete with other forms of power, light and heat it is necessary to wire premises completely, particularly when the consumer is a tenant only, and to install cooking and heating apparatus on hire at an initial expense to the undertaking. The author has assumed that the average "life" of the connection to mains, meter, wiring installation and cooking and heating apparatus is amply covered by an equal annual payment over ten years, plus 2½ per cent. equated interest. This is considered a safe provision, but, in order to cheapen the supply, it may be found practical to extend this period.

**Fixed Costs.**—All charges upon an undertaking of any description—other than service costs—which can be accurately or approximately stated at the commencement of each financial year are fixed costs. The sum of the charges thus stated, divided by the maximum demand made by the consumers as a whole, will produce a cost per kilowatt chargeable annually to each consumer, governed by the diversity factor of each class. The author suggests that the following charges can be allocated to fixed costs:—Interest and redemption, management charges, rent, rates, and taxes, inspection of mains, the wages payable to the running staff at the works and sub-stations (but not overtime and temporary labour, which are chargeable to running costs).

For the past year at Poplar, the service costs were 0.01d., the fixed costs 0.54d., and the running costs 0.303d. per unit sold.

The Paper would not be complete without reference to what might appear to be an important omission in connection with charges for a universal supply of electricity, viz., the prepayment system. The author has purposely refrained from introducing this phase of the supply because of the fact that little data are as yet available. It is proposed to go well ahead in Poplar very shortly, and, roughly, the outline of the policy is as follows:—Mains will be laid in every thoroughfare at the earliest opportunity, thus entirely eliminating gas from the streets. In connecting up, the first objective will be tenement buildings, which present the least initial outlay per head of the population. The consumers will be divided into three classes, viz., lighting only, lighting and hotplate, and lighting and cooker. Payment will be obtained through penny coin meters at a rate according to the demand of each class.

The cooking class will probably be charged at the inclusive rate of 1d. per unit (lower if possible), but an average monthly use of a given number of units must be registered or the meter will be changed to the hotplate class at, say, 2d. per unit, also with a minimum monthly use, from which transfers would be made to the lighting class at, say, 4d. per unit. This is a rough outline, which may be improved upon as experience is gained. Originally the Author favoured the idea of, and has had specially made, a differential meter which would change over after the insertion of a given number of pence at a higher rate than 0.5d. per unit, which would, with a certain monthly use at a high rate, return to the undertaking the fixed charge based on the cost of the installation, and then allow of the continued use to the end of the month at the running charge only. The great objection to such a system is that at the end of a month a consumer would probably be obtaining energy at the rate of 0.5d. per unit, but on the first and following days of the following month would have to pay 4d. or 2d. as the case might be. It was recognised that any such system would find ill favour with the working classes, as it would be impossible to explain the ethics governing such procedure. However, in order to preserve equity throughout it is practical to endorse on each consumer's card a number of units to be used each month, after which a return will be made to the consumer of the difference between 0.5d. and the rate at which energy is being paid for. Thus, if 250 units per month at 1d. per unit is considered a fair return for a cooking and lighting supply, a refund of 2s. 1d. would be made if 300 units were found to have been consumed.

### DISCUSSION.

Mr. C. H. WORDINGHAM (Admiralty) said that they were trying to sell a product and to get money for it, and all the juggling in the world would not prevent people having to pay for what was being sold to them. He did not agree with the remark that any available profits might be taken to provide special public improvements; this was quite inconsistent with the author's previous view that profits should not be taken to relieve rates. The proper thing to do was to put all profits back into the undertaking. Mr. Wordingham then indulged in some good-humoured chaff as to the author's announcement that the laws of expediency might govern private enterprise, but municipal enterprise was governed by the laws of equity, and quoted passages in the Paper relating to the arbitrary adjustment of diversity factors for the purposes of the tariff explained, to show that the author was not quite true to his principles. He did not say that expediency was wrong, but most makers of tariffs would, he thought, have to admit that they were based on expediency. He fully agreed with the author, however, that the rateable value system was an entirely inequitable and wrong basis, and he still firmly held to the old original Hopkinson system of charging. It did not so much matter whether the consumer understood it or not; what the consumer

did understand was his bill, and if he found by the Hopkinson system that he was charged less than by a flat rate it was all he wanted to know in the long run.

Mr. F. M. LOWE (Chief Electrical Engineer, Norwich) said that what might be equitable from the seller's point of view would not be always equitable from the buyer's point of view; it was no use having a system which produced the impression upon the consumer that he had been cheated. He took as an example a man who started with a 1-kw. radiator in his house, for which Mr. Bowden would charge him 8s. a year. This radiator was used first in one room and then in another, but in order to save himself the trouble of moving it about, the consumer put in another radiator. Mr. Bowden would want to charge him another 8s. a year, but the man would very reasonably object. With the high diversity factor obtained with a cooking load, current could be supplied at a flat rate, and in most cases at  $\frac{1}{4}$ d. The bulk of fixed standing charges were made up of interest and sinking fund on plant, which had cost far more than had to be paid now. It was possible to add plant nowadays at a very much lower rate, something between £3 and £4 per kilowatt, and it would be found that the running costs with a cooking load were about 0.3d. per unit. Mr. Bowden himself admitted this in the case of a power load. In competition with gas, electricity was in a much more favourable position with regard to lighting than heating and cooking, and they could therefore put all the high standing charges against lighting. If it were worked out it would be found in many towns that the rateable value did bear a very close relationship to the demand which a consumer would make for lighting his house. He took one of Mr. Bowden's examples and showed that practically the same charge would be arrived at under the rateable value system and in a very much simpler manner.

BAILIE W. B. SMITH (Glasgow) said he was in general agreement with the principles laid down in the Paper, and especially that the electricity department should not contribute to the rates. The man who had shut down his boiler plant and took electricity not only paid for his current, but under the present bad system actually paid a certain proportion of the rates of the man next door, who was working on the bad principle. Why should this manufacturer have to pay something to the Hospitals Rate when it was the man next door that was causing much of the ill-health in the town? He suggested that the convention should pass a resolution that in the I.M.E.A. Bill a clause should be inserted, prohibiting the use of electricity profits for the relief of rates. There was a precedent for this in the Glasgow Consolidated Bill in connection with the Glasgow Corporation gas undertaking, when the House of Lords struck out a clause enabling surpluses to be devoted to public services, on the ground that the clause had been in use for 46 years, but had never been put into force, and consequently could not have been needed.

ALDERMAN J. W. CROWTHER (Sheffield) gave some figures to show the tremendous field still unexploited for electric lighting purposes. On March 25th last there were in Sheffield 107,288 houses rated, and out of these 91,811 were under £15 per annum annual value; 6,827 at a rateable value of between £15 and £20 per annum; 3,299 were between £25 and £30 per annum; and the larger premises numbered 5,321. The rate books showed that of the 91,811 houses under £15 per annum only 10 per cent. took electricity; of the £20 to £25 houses, 35 per cent. were supplied; of the £25 to £30, 40 per cent. were supplied; and of the houses above that value, from 65 to 70 per cent. were supplied. It was stated in the Paper that shopkeepers were unfairly charged on the rateable value system, but in Sheffield they made concessions to shopkeepers, and offered current at 2d. instead of 4d., and so they would be put upon equal terms with the rateable value system.

Mr. H. RICHARDSON (Chief Electrical Engineer, Dundee) expressed the view that until the industry got hiring powers the cooking load must be regarded as a mere bagatelle. The public had been taught by the gas people to hire such things as cookers, and the electrical people would have to hire them in the same way. He had found in his own house that at  $\frac{1}{4}$ d. electricity competed well with gas at 2s. 2d., and he failed to see that it was necessary to go down to  $\frac{1}{4}$ d. per unit for heating and cooking to compete with gas at 2s. 6d. He agreed with the rateable value system, provided the circumstances were suitable, but in all towns this was not so. He had tried to apply it in Dundee, but had failed. If they tried to make themselves a little less exact in these commercial matters than they did in their engineering matters they would do better. He pleaded for simplicity, and did not agree with Mr. Wordingham that the consumer did not worry about how his bill was calculated so long as he could understand the amount.

Mr. A. S. BLACKMAN (Chief Electrical Engineer, Sunderland) said that the success which Mr. Bowden had achieved at Poplar was sufficient proof that there was nothing very far wrong with his tariffs, although in detail he might join issue with him upon several points. For instance, he thought Mr. Bowden was unnecessarily handicapping himself in sticking to his kilowatt charge, when he had ready to hand a very much more simple and more easily applied rateable value system. Mr. Bowden stated that he did not agree with another department of the Corporation assessing the standing charge for electricity consumers, but it was the electricity department which assessed

the percentage the consumer had to pay, and the fact that the electricity department merely made use of the scale of assessments already in existence could not be turned round and be used as an argument that the electricity department was being handed over to another department of the Corporation. It was perfectly painful to him to hear people talk about 1-kw. radiators. In Sunderland they had sent out 1-kw. radiators, and the result was nothing but dissatisfaction. They were now putting out nothing but 3 and 4 kw. radiators, and the result was absolute satisfaction. In Sunderland gas was cheap, but he found that at  $\frac{1}{4}$ d. he was doing a very large amount of heating indeed. He suggested that they should take a leaf out of the draper's book and deal in fractions of a penny. In Sunderland they fixed their lighting tariff at  $\frac{1}{4}$ d. for public houses, and he had now got every public house and hotel on his mains. There was no standardisation in the price of gas throughout the country, and he failed to see how we could expect to get standardisation in the charge for electricity throughout the country.

Alderman SINCLAIR (Swansea) said they could never obtain standardisation of price, although they might obtain some standardisation of method. He did not think the future of electric cooking would wait for any Parliamentary Bill. The time was bound to come when the electrical engineers and managers would have to give up all idea of peak load or maximum demand, and the fear of having insufficient copper in the ground, and sell any consumer current for any purpose he desired at a cheap rate.

Councillor A. H. DYKES (Beckenham) said that the poor man, with his two or three rooms, paid treble for his gas or oil lighting than those who used electricity. He gave some figures in support of this, and added that a penny placed in a penny-in-the-slot gas meter in most towns in England would not burn one gas lamp for a winter's evening. He mentioned that in Wimbledon Mr. Tomlinson Lee had connected to the main 5,000 lamps, every one of which was previously supplied by penny-in-the-slot gas meters. These represented 1,000 consumers, the increase in revenue was something over £1,000 a year, and by the end of the present year it would probably be nearly £2,000. He argued that it was unnecessary to put in a meter for this class of consumer. The few extra units which some consumers might use, he contended, would not necessitate more plant at the station, nor an increase in the size of the mains, nor additional supervision or wages. It simply meant (in A.C. stations at any rate) that these extra units would cost  $\frac{1}{4}$ d. a unit for fuel. What was the sense in putting in a meter, reading it, and maintaining it in order to ascertain whether a man with four lights was going to burn an extra 20 or 30 units per annum. Mr. Lee got over the difficulty of cost by running the service into the first house in a row, and looping through sometimes into as many as 20 houses from the one service. Although the system had only been in operation for some eighteen months, the number of lamps connected per service was 22 or 23, and it was increasing every month. This had been brought about by an arrangement with the Fixed Price Light Company, who dealt with the consumers direct on the basis of so much per lamp per week. At Wimbledon it was 3d. in the winter and 2d. in the summer, and the electricity undertaking had nothing whatever to do except to draw a cheque from the company each quarter.

Mr. A. NICHOLS MOORE (Chief Electrical Engineer, Newport, Mon.) said that if they once got into the minds of the members of the Councils that they were endeavouring by some means to overcome the local opposition of gas companies by cutting down prices, irrespective of the rates and the ratepayers, they would create an opposition which would be most injurious to them and their undertakings. He then proceeded to point out a number of discrepancies in the Paper, and he called attention to the fact that in the Poplar accounts the net profit from cooking and heating was only £600, and Mr. Bowden himself stated that it was due to his power load that he attributed his remarkable increase in revenue. Thus it was load factor and not diversity factor which was responsible for the improved results at Poplar, where 86 per cent. of the load had the very large power factor of 33 per cent.

Mr. J. W. BEAUCHAMP (Chief Electrical Engineer, West Ham) dealt first with Mr. Bowden's suggestion that the time would come when electricity would be supplied at a fixed charge without any secondary or running cost. This second charge, he contended, must be maintained, because no two consumers would use the same amount of electricity for the same kilowatts of demand. He disagreed with the rateable value system. There was no doubt, he said, that there was considerable relationship between the rateable value of domestic premises and the average bill for electric light, but he thought it was not right for another department to be able to alter the assessment of probably five-sixths of their consumers. Furthermore, he had been told that the Budget had foreshadowed to some acute person that there would be some different way of raising money as between the assessment of land and buildings, and this might knock such a tariff all to pieces. He suggested that the system might be used for a time merely as an internal indicator, but objected to declaring to the consumer that they based his charge on the assessment of his house. If a consumer's assessment was increased and his electric light bill was based on the assess-

ment, he would argue that he was not using any more light under his new assessment than under the old one. If he did not know the basis of his charge, he could not make this objection. On the other hand, he failed to see why the department should suffer because the assessment of a particular district went down.

Mr. F. S. GROGAN (British Electric Transformer Co.) said that Mr. Bowden's and the rateable value system had the same disadvantage, that with higher rated houses it was impossible to get the consumer to take on the domestic load, as his standing charge came out at too high a figure to start with. Mr. Bowden had brought out a very important point when he stated that the diversity factor of cooking would charge with different types of cookers. With a cooker which is very highly loaded in order to get quick initial heating of the oven, the diversity factor, with the maximum possible load on such a cooker, must be greater than on a cooker which would employ a lesser degree of loading for a long-continued period. He appreciated the value of slot meters for a cooking load, and the author's suggestion that a rebate should be made by the collector; this had been adopted successfully by the gas companies.

Mr. H. R. BURNETT (Chief Electrical Engineer, Barrow-in-Furness) said that in Barrow, out of 1,760 domestic consumers, 1,000 were of the artisan and labouring classes. Many of these had been supplied for about twelve years, and up to two years ago they were all charged through prepayment meters at 4½d. per unit. There had been many complaints, however, due to troubles with the meters and to the price paid, and he had instituted a system of charging at a fixed price per week, based roughly on the demands and also upon the rent, plus 1d. per unit. The effect had been to increase the consumption by 100 per cent., and there were now no complaints whatever. He thought it was unfortunate that many engineers had adopted as low a running charge as they had done. Mr. Vignoles in his Paper had worked out the running charge at 0.36d. with coal at 7s. 6d. per ton. Probably most engineers were paying nearly double that, and therefore a running charge of 0.5d. per unit would certainly not allow any margin for anybody paying 15s. per ton for coal. He could not help thinking that some engineers, either in their desire for notoriety or in order to qualify for membership of that very select body, known as the Point Fives, had allowed their judgment to be overweighed by that fact, and to fix prices which were not altogether justified by the costs.

Most of the members found time to pay brief visits to the places of historic interest at Stratford, and after lunch they returned to Birmingham by road, visiting Warwick Castle on the way. In the evening the Birmingham Entertainments Committee entertained them at an open-air fête in the Botanical Gardens, concluding with a splendid display of fireworks.

## THE POINT FIVE ASSOCIATION MEETING

WITH characteristic energy the "Point Fives" met on Thursday night, after the return from the fête at the Botanical Gardens, and the debate was opened by the Chairman, Mr. S. T. Allen (Chief Electrical Engineer, Wolverhampton), at the stroke of midnight.

He reminded the members that the principal objects of the Association are to encourage and develop the use of electricity for all possible domestic purposes. It might be said that so long as the Association was, as a whole, benefitting the undertakings of its members, they should be satisfied, but he did not hold this view. The results of the investigations of its members relating to cooking apparatus, for instance, were of great use, not only to the manufacturers, but to other undertakings, and it was distinctly to the advantage of the Association to publish their deliberations as widely as possible, and invite fair criticism both at their general meetings and elsewhere. That brought him to a point which they might discuss, viz.: were they aiding the manufacturers to decide what particular type of any piece of domestic apparatus was most suitable to the general body of users, and in what manner could they further the standardisation of apparatus. Standardisation must ultimately benefit themselves and the industry generally by cheapening the apparatus under consideration, and bringing it within the reach of a larger number of consumers. A standard could only be set up after a decision of a large majority of all interested parties that their specification conformed with the requirements which would benefit everyone concerned. This would also prevent the unnecessary changes in details which went so much towards hampering real progress. How often did we see, when something new and quite good had been designed to form the principal part of a piece of apparatus, that all the remainder was designed apparently with the idea of keeping it as unlike any existing and well-tried article as possible. It had been suggested that a central bureau might be established to test and report upon cooking, heating, and other domestic apparatus, but in his opinion the strongest bureau which could possibly

be established was already in existence, and had for its working committee the members of the Point Five Association. They were themselves handling a large proportion of such apparatus, and were closely in touch with a large number of householders and cooks who used it, and besides, the members and their staffs had the best opportunity of having practical tests made at home.

One of the things most impeding progress was the inability of a great number of authorities to hire out apparatus; immediately an undertaking was able to put into operation a suitable tariff, there arose a demand for cookers, heaters, &c., on hire. Those undertakings who possessed such powers had been able, with a suitable tariff, to increase their business enormously, and it seemed incredible that anybody, except those interested in the gas concerns, who already had such powers, could be opposed to any measure granting hiring powers to electricity supply authorities. He was of opinion that by far the greater majority of the "rank-and-file" of the electrical contractors were not opposed to any such measure.

In Wolverhampton they had full powers, and the point five tariff came into operation last autumn. During the first six months the number of private-house installations connected had been three times as many as the number during the same period during the year previously, and they had supplied on hire just 500 kw. of heating and cooking apparatus. Through the kindness of the other members, he had been able to ascertain that, since the point five tariffs had been in vogue, connections for about 10,000 kw. had been made, and about 7,000 kw. of cooking and heating apparatus had been connected up in private houses. Obviously, without the hiring powers, the greater portion of the 7,000 kw. would never have been connected at all—much to the loss of the consumers, the manufacturers, the supply undertakings, and to the wiring contractors, who carried out more than three-quarters of the necessary wiring work.

In the concluding part of his address, Mr. Allen referred to the electric vehicle question. This brought up a tariff question which would probably have to be considered by several members before long, viz.: How should electric car battery supply be charged to those domestic consumers now enjoying the point five tariff? Owners of private electric cars would not be content to use the central charging stations. Battery vehicles of the present types would be restricted a good deal, so far as private vehicle users are concerned, to doctors and such persons, who would use the vehicle purely for local travelling, so that the charging supply should be a regular one, and a good one so far as revenue was concerned, provided that the tariff was correct. He did not think that domestic consumers already enjoying the point five tariff could be definitely restricted in the times they should take such charging supply, and a two-rate tariff (on flat rates) would not be sound. He saw no reason, however, why such a demand could not be treated separately on the differential system of charging with the units used charged at a halfpenny per unit. The fixed amount per annum could not in this case be so easily determined as that due to a lighting supply, for instance.

Mr. T. ROLES (Bradford) said that he was considering putting shops on the point five tariff, but the difficulty was with the fixed charge, as in this case the rateable value system would not be suitable. [Mr. Bowden: Hear, hear.] He referred to the Bradford Exhibition, an announcement with regard to which appeared in our columns last week. This had been recognised by the B.E.A.M.A., to whose requirements they had given way in some respects, but these had been more or less reasonable, rather more than less. He agreed that a standard cooker was desirable. So far at Bradford there had not been much cooking, and he was looking to the Marylebone experiments and hoping to introduce a hire system soon. He complained that the Point Fives were not taken sufficiently seriously by the I.M.E.A., and thought that they should be better represented on the Council.

Mr. W. A. VIGNOLES (Grimsby), who is not yet a member of the Point Fives, referred to his Paper (published last week), which showed that the point five tariff could be applicable in his town. He presumed, however, from the Chairman's address, that a second charge of slightly over a ½d.—say ¾d.—would also bring eligibility to the Point Five Association. He agreed that the Association should be better represented on the Council of the I.M.E.A.

Mr. A. H. SEABROOK (St. Marylebone) said that in his district the comparatively small motor load had now all been catered for, and cooking had become regular routine work. He was, in fact, now discontinuing some of the records of faults, &c. On his hiring system, he found that, after allowing for maintenance, &c., a small margin was left for depreciation. His recent experience with water heating with improved thermostats now obtainable showed that electricity at ½d. worked out at a lower cost than gas at 2s. 6d. These electric water heaters with thermostats were now being used in public conveniences in Marylebone. A new application of electric heating such as this would entirely upset Mr. Bowden's proposed tariff. One of the most urgent things to be dealt with now was the trouble with "flex"; he suggested that something like cab-type sheathed cable should be used, but with a nice-looking braiding. Another was the screw lamp-holder, which he thought they should endeavour to get the Engineering Standards Committee to standardise, and he hoped that this type of holder would be retained for half-watt



lamps. He did not think that there would be any difficulty in using the rateable value system for electrical vehicles, as the houses with garages were already rated higher on that account. As to the rateable value system generally, he had kept careful records for twelve months, and found that the fixed charge on that basis agreed very well with his previous assessments.

Mr. J. H. BOWDEN (Poplar) said that he was hoping to hold a joint electrical exhibition with Stepney, Shoreditch, and Hackney in the near future. He suggested that a cooker with a hot-plate which showed red-hot would be much approved.

Mr. J. CHRISTIE (Brighton), who is not a member of the Point Fives, said that if he introduced the price of 0.5d. per unit for cooking, the tramways would ask for 0.5d. also. At Brighton he supplied for the tramways and other power purposes four or five million units at 1d. less 10 per cent., and did not want to lose practically half this revenue. He mentioned also that he was applying for a loan for heating and cooking apparatus, on the basis of a ten-years' life, and was waiting to see how the L.G.B. received the proposal.

Mr. S. E. FEDDEN (Sheffield) said that the rateable value system was only intended for small consumers. He was extending heating to small shops, offering a discount of 50 per cent. off the standard heating and cooking rates on a guarantee of  $4\frac{1}{2}$  hours user per day; the price could thus be calculated in advance. He hires out cookers costing £8 or £9 at 4s. 6d. per quarter, as he feels that the cost of these will go down in the near future, but does not hire out heating apparatus, as the demand for them is already greater than he can get deliveries for. He believed in high ratings for radiators, and supplied 2, 3, and 4 kw. fires for installing alongside gas fires as an experiment; the experiment was always successful. Several restaurants were being supplied at  $\frac{1}{2}$ d. a unit plus a fixed charge, after their proprietors had inspected successful installations in London.

Mr. W. H. COOKE (Luton) said that it was not the object of the Point Fives to discuss whether the rateable value system should be adopted or not. When the system answered, it was pure chance that the assessment of the other department had happened to agree with the charge that should be made by the electricity department. He himself used a flat rate of 0.5d. per unit. In dealing with inquiries for industrial purposes, he had sometimes been able to quote as low as 0.35d.

The discussion was carried on by Mr. NICHOLS MOORE (Newport, Mon.), Dr. H. GERVIS (Brighton), Mr. A. S. BLACKMAN (Sunderland), and Mr. F. W. PURSE (Carlisle).

Mr. GOGAN (British Electric Transformer Co.) spoke in strong opposition to the use of 400 or 500 volts on cookers—by balancing the two parts of a cooker on the three-wire system—which had been authorised by the Board of Trade at Marylebone and Birmingham. He argued that a switchboard attendant might break the station earth connection, and so endanger the life of a cook working on an electric cooker which had developed a fault.

The meeting terminated shortly after 2 a.m.

## ANNUAL GENERAL MEETING

The annual general meeting was held in Birmingham on Friday.

As a result of the alteration in the Articles of Association sanctioned at the annual meeting last year, the election of Council and officers is now carried out exactly as by the Institution of Electrical Engineers. Accordingly a list of the Council's nominations had been circulated previously to the meeting, but no further nominations were received. As the result of the ballot, the Council will be constituted as follows for the ensuing year:—

**President:** \*H. Richardson (Dundee).

**Vice-Presidents:** A. C. Cramb (Croydon) and \*F. M. Long (Norwich).

**Past Presidents:** J. Christie (Brighton), G. Wilkinson (Harrrogate), and R. A. Chattock (Birmingham).

**Other Members of Council:** A. H. Seabrook (Marylebone), S. J. Watson (Bury), F. Ayton (Ipswich), T. Roles (Bradford), S. E. Fedden (Sheffield), W. Wyld (Hampstead), \*W. A. Vignoles (Grimsby), \*J. W. Beauchamp (West Ham), \*A. S. Blackman (Sunderland), Councillor Gibson (Wolverhampton), Alderman Sinclair (Swansea), Alderman J. P. Smith (Barrow-in-Furness), Councillor Ellaway (Birmingham), \*Alderman Crowther (Sheffield), \*Councillor W. B. Smith (Glasgow).

The names of members elected to fill the vacancies are marked with an asterisk.

A portrait of the new President appears opposite.

Some discussion took place as to the form of the ballot paper, which stated that the number of names left "must not exceed or be less" than the number required for the several offices. One or two members took the view that there should be the right to vote for a less number than the required number; in other words, that "plumping" should be allowed. It was pointed out that the Articles of Association did not permit of this, and a subsequent resolution by Alderman Foster (Portsmouth), seconded by Mr. F. W. Purse (Chief Electrical Engineer, Carlisle), that future ballot papers should be altered

in this respect, although receiving a fair amount of support, was easily defeated.

The place of meeting next year was left for final choice with



H. RICHARDSON.  
(President of the I.M.E.A.)

the Council, although Bailie Nairn, of Dundee, said the Corporation would be most happy to give the Association a hearty welcome to the city.

## Annual Report.

The annual report, which is abstracted below, was next presented. Much of the information has already been reported in our columns, through the courtesy of the Association, and is not now repeated.

**Membership.**—The membership of the Association now stands at 379:

Committees (Members) ... ..	165
Chief Electrical Engineers (Members) ... ..	175
Honorary Members ... ..	6
Chief Assistants (Associate Members) ... ..	4
Assistants (Associates) ... ..	29

379

There is a decrease of seven on last year's total, chiefly among the Associates.

**Standardisation of Metal Filament Lamps.**—The Association's representatives on the Lamp Standards Committee of the Engineering Standards Committee (Messrs. Fedden and Wilkinson), in conformity with a unanimous resolution of the Council, urged the adoption of watt marking only. They found themselves in direct antagonism with representatives of the War Office, the Admiralty, the Post Office, and Public Works, all of whom were tied down to vote under the direction of their respective departments, though, as a matter of fact, they were personally in sympathy with the views of the I.M.E.A. The Standards Committee, by the majority of the votes from these officials, decided to adopt the standard of marking both the candle-power and watts on lamps. The I.M.E.A. strongly objected to this, and urged the Tungsten Lamp Association to adhere to the resolution already adopted by them in regard to watt marking only. The Tungsten Lamp Association in reply expressed their hearty approval in support of the marking of all lamps with watt rating only. The only exceptions made by members of the Association were where Government Departments made specific requests for candle-power markings.

It is not likely that an acceptable specification will be issued by the Standards Committee unless the contemplated rearrangement of the Standards Committee should result in considerable change in its constitution.

**Electric Lighting Bill.**—The Council has spared no efforts to press forward this matter, and desires to acknowledge the work done and assistance rendered by Mr. Hugo Hirst and the late Mr. A. Bruce Anderson, Chairman of the B.E.A.M.A. A circular letter was sent to all members of the Association with regard to securing promises to ballot from the various Members of Parliament, but no place was secured which could be of practical use. A new clause for the exemption of fittings, &c., let on hire by contractors has been inserted, and the powers originally sought under Clause 1 (powers to provide electrical fitting) has been amended, and the Bill in its present form has the support of the British Electrical and Allied Manufacturers, and it is believed of all other interested parties except the Electrical Contractors' Association, who have declined to accept

the proposed amendments and have also signified their refusal to have the matter submitted to arbitration. [An abstract of the Bill appeared in *ELECTRICAL ENGINEERING* of March 5th, 1914, p. 127.]

**Model General Conditions.**—The report states the position of the Association in this matter, which was mentioned in the President's address, published last week.

**Gas Companies and Electricity.**—A large number of gas companies have sought powers to carry out the generation and distribution of electricity. Opposition has been brought to bear in several cases, and promoters have withdrawn the clauses to which exception has been taken.

**Industrial Committee.**—The Institution of Electrical Engineers having disbanded the Industrial Committee, the Council have considered the desirability of the formation of an influential body representative of all sections and departments of the electrical industry, competent to deal with all matters of grave importance to the industry. It was agreed that the proposal be approved in principle, and that preliminary arrangements be entered upon.

**Engineers' Salaries.**—At the annual general meeting last year Mr. Burnett, of Barrow, asked the Council to consider the question of the salaries paid to central station Engineers and their assistants, with a view to bringing pressure to bear upon municipalities to improve their position. The matter was carefully considered in all its bearings, and while in agreement with the suggestion in principle, the Council was unable to take further action in the direction indicated.

**Travelling Studentship.**—There have been no entries for the Travelling Studentship during the past three years, and the Council's communications to the Associates regarding the reasons for the lack of interest in the matter, and inviting observations and suggestions, did not elicit any helpful response.

**Standardisation of Electrical Apparatus.**—A Sub-Committee, consisting of Messrs. Cramb, Wilkinson, Fedden, and Seabrook, has been appointed to deal with the standardisation of electrical accessories, including cooking appliances. The Engineering Standards Committee have invited the appointment of two I.M.E.A. representatives on their Electrical Plant Accessories Sub-Committee. Mr. Cramb and Mr. Seabrook have been so appointed, Mr. Wilmshurst, the former representative, having resigned. It is considered desirable that the I.M.E.A. should be represented upon all Sub-Committees of the Standards Committee on Electrical Engineering, and the Engineering Standards Committee have been approached upon this matter.

**Yorkshire Electric Power Co.'s Bill.**—The Council, having first ascertained that all Local Authorities affected by the above Bill were taking action, resolved as follows:—"Whereas the Association note with concern the attempt of the Yorkshire Electric Power Co., in its Bill, to appropriate all districts within its area which do not already form part of the area of supply of an authorised distributor; also in view of the fact that such powers would seriously interfere with the development of municipal areas, and would in all probability entail a payment of compensation for goodwill in the event of an extension of borough boundaries or municipal lighting areas, the Council note with satisfaction that a petition is to be presented by the non-County Boroughs of Batley, Brighouse, Doncaster, Keighley, Morley, Ossett, and Todmorden, and assures the various authorities of the moral support of the Petition."

**N.A.L.G.O. Delegate's Report.**—The Council of the National Association of Local Government Officers held a very successful meeting at Bristol on March 14th. A superannuation scheme has been prepared, about two hundred members of Parliament supported the principle, and the Chancellor of the Exchequer is being asked to receive a deputation from the Association, when the possibility of a grant from the Government towards the cost of the scheme will probably be raised. The establishing of a Provident Section to commence with a deposit scheme for sickness benefits, and a scheme for death benefits, was also discussed, and the recommendation carried. The I.M.E.A. Council is represented on the National Council of the N.A.L.G.O. by two members, Mr. J. E. Edgcome and Mr. Wyld, but Mr. Edgcome was unable to attend the meeting through illness.

## DISCUSSION.

### The I.M.E.A. Bill.

The HON. SECRETARY (Mr. H. Faraday Proctor), in answer to a question by Mr. Hoadley (Maidstone), said that the exact position of this Bill from the Parliamentary point of view was very much the same as it was at the last Annual Convention. The Association had circularised all the municipalities, asking them to get their Members of Parliament to do what they could for the Bill and to ballot for a place, but they had not been able to obtain more than two or three promises up to the date of the taking of the ballot. If the members of the Association could not get their Members of Parliament to do something in the matter, it would be impossible for the Association to get the Bill through on present lines. The Association had the sympathy and the active interest and support of everybody interested in this matter, with the exception of the Electrical Contractors' Association. They had the support of the technical Press, with the exception of *Electrical Industries*. They also had the support of the B.E.A.M.A. He felt that if a large

number of members could join together and promote a Bill for their own undertakings, instead of relying entirely on the I.M.E.A. Bill, they would be successful in getting the powers they wanted. The difficulty was not in getting the Bill through the House itself as getting it before the House. They had the support of Lord Amthill, who had promised to give his active support in the House of Lords. Lord Amthill had told him that he was sure the matter was misunderstood when it was before Parliament previously, and now he (Mr. Proctor) really did not fear the House of Lords any more than he feared the House of Commons.

Mr. W. C. P. TAPPER (Stepney) asked if it would be possible to initiate the Bill in the House of Lords instead of in the House of Commons.

The HON. SECRETARY replied that the Hon. Solicitor said, practically speaking, it would not be possible.

Mr. C. TURNBULL (Tynemouth) asked if there was any precedent for a combined Bill of this sort.

The HON. SOLICITOR said there were precedents among the gas companies who had promoted Bills jointly for removing the restrictions upon the right to send sulphur fumes into houses and public streets, and they had been successful in getting these restrictions removed.

Mr. C. F. McINNES (Gravesend) proposed that the Council should take steps to ascertain which municipalities would join in promoting a combined private Bill.

This was put to the meeting in the form of a resolution, seconded, and carried.

Mr. R. H. CAMPION (Dewsbury) said that if this was done it would assist many authorities in the same position as his own. The Dewsbury Corporation were going for Parliamentary powers in an "omnibus" Bill, and were inserting these clauses. The Town Clerk had told him, however, that these clauses would be dropped if they were opposed, and therefore if a combined Bill could be promoted it would be of great assistance to him.

### Model General Conditions of Tender.

The HONORARY SECRETARY stated, in reply to Mr. Brydges (Eastbourne), that the views of the I.M.E.A. Council were not very divergent from those of the Institution of Electrical Engineers. He reminded the meeting, however, that twelve months ago the members did not agree with certain recommendations made by the Council of the I.M.E.A., and it was decided that nothing further should be done until the Association of Municipal Corporations had made a move in the matter, and that no communication be made with the B.E.A.M.A. meanwhile. Although the Association of Municipal Corporations was communicated with twelve months ago, he had only received on the previous morning a communication from the legal committee of that body, and this had still to be submitted to their full Council. He had received a communication from the B.E.A.M.A. stating that they were proposing to adopt the conditions as issued by the Institution of Electrical Engineers for a period of one year in respect of municipal contracts in order to see how they worked. The views of the I.M.E.A. were asked upon this matter, but the Council had not been able to deliberate upon it because the members had tied their hands by the resolution passed twelve months ago; he did not think the Council could take any active steps until their hands were untied. He thought it could only be left to municipalities to deal with the manufacturers as points arose.

### I.M.E.A. Conditions for Supply of Electricity.

A draft of proposed conditions had been attached to the Report.

Mr. J. A. BELL (Aberdeen) drew attention to the question of fire insurance of the supply authorities' apparatus upon a consumer's premises. In a recent case he was unable to recover because negligence could not be proved against the consumer.

The PRESIDENT said the point would be considered before the conditions were finally issued.

Mr. A. G. COOPER (Colne) said the same thing applied to apparatus on hire.

The PRESIDENT said there was always a special agreement with the consumer for the hire of apparatus, and that should include special provision against fire.

Mr. W. C. P. TAPPER (Stepney) said he had got over this difficulty by taking out a special policy at Lloyd's to cover any apparatus on hire, motors, service lines, &c., and did not worry the consumer about it at all. The premium was 2s. 6d. per cent.

Mr. H. S. ELLIS (South Shields) thought this matter should be looked after by the department, as consumers objected to be worried with these matters.

The report, including accounts, were then put to the meeting and carried.

### The late Mr. A. B. Anderson.

On the motion of the President, the following resolution was passed, the members standing:—"The members of the I.M.E.A., in their annual meeting assembled, are desirous of expressing to the widow and family of the late A. Bruce Anderson, Esq., their sincere sympathy and regret at the deplorable loss sustained owing to his death on the occasion of the foundering of the *Empress of Ireland*, also to sympathise with the B.E.A.M.A. in the loss of such an energetic and valuable Chairman."

### The Industrial Committee of the I.E.E.

Mr. A. H. SEABROOK (Marylebone) moved the following resolution: "That this Association regards with dissatisfaction and regret the dissolution of the Industrial Committee of the Institution of Electrical Engineers. They consider that it is within the province of the Council of that Institution, and urge that steps be taken to watch over the industrial and commercial, as well as the scientific and technical interests of the membership."

Mr. A. C. CRAMB (Croydon) seconded.

After a short discussion, it was seen that the general feeling of the meeting was that it would be a wrong policy also for one association to censure another, although several members sympathised with the object of the resolution, and Mr. Seabrook therefore withdrew it.

### The Development Committee.

Mr. W. A. VIGNOLES (Grimsby) moved: "That a Special Committee be formed of members of this Association, not necessarily members of the Council, to deal with any matters that may tend to encourage the use of electricity from the public supply mains, and that this Association shall invite other associations and persons who may assist in furthering the object for which the Committee is formed to join such Committee." It had been suggested, continued Mr. Vignoles, that a Committee should be formed to replace the defunct Industrial Committee, but this he regarded as too large a task for the Association to tackle. An association had been formed some time ago called the "Association for the Protection of Electrical Interests." It met a few times, but apparently did not find anything to protect, and finally abdicated. After that the Industrial Committee of the Institution of Electrical Engineers, as they had heard was formed, and met on a number of occasions, but that finally committed suicide. The reasons for this he thought was that these committees were not promoted by the right people, or did not get the right members upon them, or there was a clashing of interests. This would not be the case with the new committee, because the interests of all the members of the I.M.E.A. were the promotion of the use of electricity. He proposed that it should be left to the Council to select the Committee.

Mr. T. ROLES (Bradford) seconded. Some such action as this, he said, was necessary in view of the activities of the British Commercial Gas Association, and the class of man required upon it was represented by Mr. Vignoles himself.

Alderman J. P. SMITH (Barrow-in-Furness) suggested that it would be wiser to take some particular subject and appoint a committee to go into that. The Electric Vehicle Committee was an example of the advantage of that policy; to tackle the whole question of publicity throughout the electrical industry was a very big subject, and he would like to put forward a suggestion which he had heard made on the previous day that a committee consisting of three or four members of the Council and others directly interested in cooking should be formed to deal with the matter specially. A round table conference between that committee and manufacturers of apparatus to discuss the pros and cons would do an immense amount of good. There might be other things which could be tackled in the same way later on.

Mr. F. AYTON (Ipswich) expressed his entire sympathy with the proposal made by Mr. Vignoles.

Mr. J. E. EDGECOME (Kingston) said that he supported the proposed committee in whatever form it was appointed. The suggestion that round table conferences between manufacturers and supply authorities would bring good results was emphasised by what had been accomplished by the Diesel Engine Users' Association, where they adopted the policy of discussing a particular point at each meeting with the manufacturers of a particular part of the apparatus. For instance, at one meeting they had discussed compressors, and the representative of Messrs. Reavell, who made these for a large number of Diesel engines, had given a great deal of useful information to the users of Diesel engines. That Association also was not confined to central station engineers, but any user of a Diesel engine in whatever form was eligible for membership.

Mr. W. H. COOKE (Luton) also expressed his support of Mr. Vignoles.

Mr. A. H. SEABROOK did not think it was worth while discussing details. The great point was to support Mr. Vignoles' proposal, and to elect the committee.

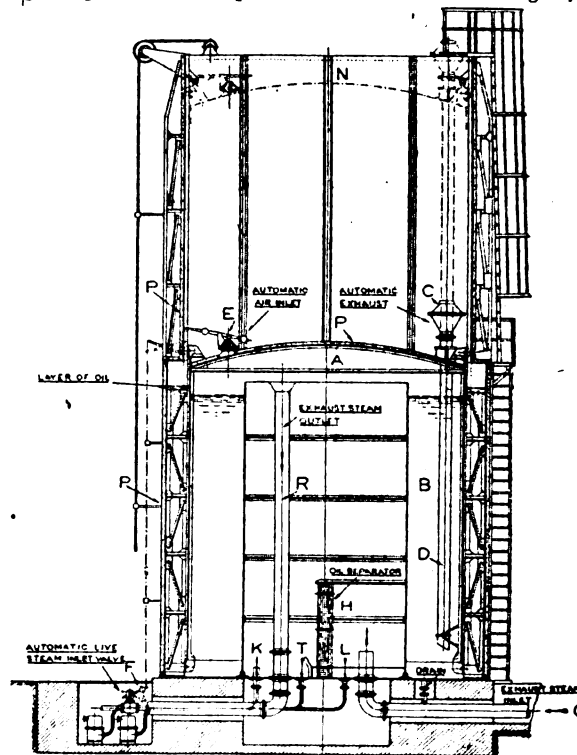
The resolution was then put to the meeting and carried unanimously.

Votes of thanks to the President, the various municipalities, and manufacturers who had entertained the Association during the Convention, and to the honorary officers, were then passed, and the proceedings closed.

The visit to the Birmingham Electricity Works on Friday afternoon was well attended, as was also the visit to Worcester on Saturday; a special train had to be engaged for the Worcester visit. Descriptions of these works appeared in our issue of June 11th.

## THE BALCKE-HARLE EXHAUST STEAM ACCUMULATOR

A TYPE of exhaust steam accumulator working in a similar manner to a gasometer, which is in use to a considerable extent on the Continent, is being introduced to this country by Balcke & Co., Ltd. (Broadway Court, Westminster, S.W.). The main point of difference between its working and that of the Rateau accumulator for dealing with an intermittent supply of steam for exhaust steam turbines is that while in the latter the steam is condensed, and re-evaporated when required by the stored heat, in the Balcke accumulator the steam is stored as steam and treated like a gas. The construction of the apparatus will be understood from the figure. The main bell, A, of rivetted steel plate floats in a water tank, B, and carries certain valves, including an automatic exhaust valve, C, consisting of a silencer and a pipe, D, which is completely sealed by the water in the annular space so long as the bell is below its highest predetermined position. If the bell rises higher, the



SECTION OF EXHAUST STEAM ACCUMULATOR.

pipe is uncovered, and the steam can escape. There is also an air inlet valve, E, which is mechanically opened when the bell reaches its lowest position, but will also open automatically if at any time the pressure in the bell sinks below the permissible value. As it is not desirable that air should be admitted very often, a live steam admission valve F is provided which is also worked mechanically and opens before the air inlet valve. The exhaust steam reaches the accumulator through the pipe G and the oil separator H, and passes to the turbine through the pipe R. Condensed water is removed through T and L and drains the separator. The whole outer shell is well lagged, and the water in which the bell floats is covered with oil to reduce evaporation and heat loss. The condensation losses are extremely small, and very little back pressure is produced. In the case of mixed-pressure turbines it is possible to control the governing by the movement of the bell.

**Electrification Produced by Dust Clouds.**—A Paper read recently before the Royal Society by Mr. W. A. D. Rudge on electrification produced during the raising of a cloud of dust, deals with a phenomenon which may prove of importance in connection with stone dusting and the coal-dust question generally. Mr. Rudge finds that the raising of a cloud of dust is accompanied by the production of large charges of electricity. Some of the dust particles have positive charges, and others negative. Either one set of charged particles settles rapidly, leaving the other set in the air, or else a charge is given to the air itself. The experiments do not show which of these views is correct. The charge is retained by the air for some considerable time. The sign of the charge remaining in the air depends upon the nature of the material used. "Acidic" bodies, such as finely-divided silica or molybdenic acid, give to the air a negative charge, whilst "basic" bodies, such as lead oxide, or organic dusts, such as flour or coal, give a positive charge. The friction between particles of similar material apparently produces sufficient electrification to account for the charges observed.

## THE FERRANTI-WATERS FEEDER PROTECTIVE SYSTEM

WE describe below a system of feeder protection for isolating faulty feeders, which has been patented by Mr. Eric G. Waters, of Messrs. Ferranti, Ltd., and is being introduced by that firm. It is already in use to a limited extent in Marylebone, and is, we understand about to be installed in some other places.

The simplest form of gear is for the case in which two sub-stations, each independently fed from the generating station, are connected by duplicate feeders. This is shown in Fig. 1, in which, to avoid confusion of lines, the three-phase cables are shown as single lines only. Immediately below the trifurcating box on each feeder is placed a ring-type current transformer, *CT*, which is simply threaded over the cable. Each has two secondary windings, *A* and *B*, which are connected together, as shown, through the coils of a dynamometer pattern relay; the secondaries *A* are connected

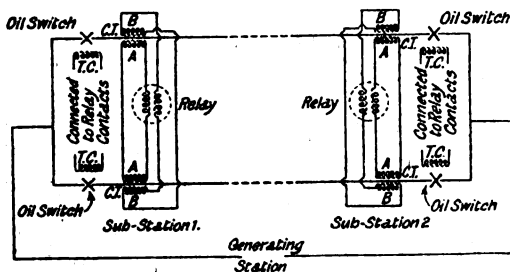


Fig. 1.

in series, and the secondaries *B* are cross-connected. The relay is a double-acting one, i.e., it can operate in two directions, thereby completing the trip coil circuits, *TC*, of an oil-switch in one or other of the feeders.

A ring-type transformer placed around a three-phase cable is unaffected by the passage of currents in the three cores in the ordinary course, whether the phases are balanced or not, since their vector sum is always zero. If, however, a fault to earth occurs, the current transformer becomes magnetised, inducing an E.M.F. in the secondary windings.

If the fault occurs on a part of the system beyond the duplicate feeder, the out-of-balance fault current divides equally between the two feeders in parallel. The E.M.F.'s induced in the secondaries *B* will assist one another, and current will flow through the coil of the relay connected to them; but, in the case of secondaries *A*, the induced E.M.F.'s will be equal and opposite, and no current will flow through that coil of the relay. Consequently the relay will not operate, and the feeders will not be cut off, which is as should be.

If the fault occurs on one of the duplicate feeders shown in the diagram, however, say the top one, this will carry a greater proportion of the fault current, and its secondary *A* will overcome the secondary *A* on the other feeder, causing a current to circulate in a certain direction through one coil of the relay. Current will also flow through the other coil in a certain definite sense. If the fault occurs on the bottom feeder, the current in the secondaries *A* will be reversed, but the current in the secondaries *B* remains in the same direction. This means that the relay will operate in one or other direction under these two conditions, thus cutting out the feeder which has developed the fault. In addition to the connections mentioned, there is a switch in the circuit of each of the *A* secondaries, which is mechanically coupled to the main switch. As soon as the main switch is operated this opens the circuit of these, and prevents the relay from acting, due to the currents which would otherwise be induced in the secondary circuits by current flowing to the fault through the healthy feeder and the sub-station, due to possible slow action of the oil-switch at the other end.

This applies to the supply end of the duplicate feeder. If the duplicate feeder is part of a ring, or connects two generating stations, the gear, as described above, is duplicated at the sub-station end. A third feeder, providing an alternative path to the sub-station, also satisfies this condition.

If, however, there is no alternative supply to the sub-station beyond the duplicate feeder, the protective gear at the sub-station end is modified as shown in Fig. 2. In this case current transformers are placed in each phase of each feeder. (To simplify the diagram one only is shown.) The secondaries of the two transformers in similar phases are connected to each other through two current coils of a special three-coil relay. The third coil of this relay is connected

to the secondary of a potential transformer, *P.T.* Details of this relay are shown diagrammatically in Fig. 8. The voltage coil is fixed, and the two current coils are pivoted on a counterbalanced arm and disposed one at each side of the voltage coil.

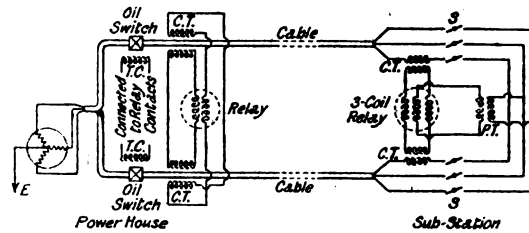


Fig. 2.

Normally the phase currents to the sub-station are equal and in the same direction. This means that the secondary E.M.F.'s of each pair of current transformers are equal and opposite, so that no current flows through the two current coils of the relay. If, now, a fault occurs on the top feeder, the current in this feeder is reversed. The secondaries now

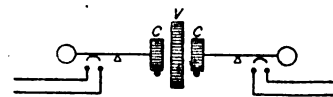


Fig. 3.

assist each other, and a strong current flows through both current coils. The coils are so wound and connected that in these circumstances they repel each other, but being on a dead centre, no motion takes place until a slight displacement of one coil is effected by the action of the voltage coil. It will be seen that one current coil will be forced against its stop, and the other will be forced away. As soon as this displacement has been effected, the motion of the moving coil is maintained by the repelling action, so that it is immaterial if the value of the voltage falls even to zero. Or to explain this in another form, the two current coils are repelling each other under the fault condition, and there is no certainty which will be forced away from its stop. This is a form of unstable equilibrium, and all that the voltage coil is called upon to do is to give one or other of the current coils a very slight impulse.

If the fault is on the bottom feeder the results are reversed, the other current coil being the one to be moved. Thus the oil-switch in one or other of the feeders is operated through the medium of its trip coil. The faulty cable is thus cut out at both ends, and the healthy feeder is left to carry the load.

A very interesting and useful feature of the case shown in Fig. 1 is that tappings may be teed off the feeders in parallel without affecting its operation.

**The Royal Society Conversazione.**—Amongst the many interesting exhibits at the Royal Society Conversazione, which was held at Burlington House on Tuesday, June 16th, was an apparatus invented by Mr. W. M. Mordey for obtaining an oscillatory motion by electrical means without the use of a make and break. This is accomplished in a very simple manner. A small single-phase induction motor with squirrel cage rotor has two spiral springs attached to one end of the shaft. When an A.C. voltage is applied to the stator terminals, and the shaft is given an initial twist, it will continue to oscillate until the current is switched off. The British Thomson-Houston Co. had on view an X-ray tube invented by Dr. W. D. Coolidge, of Schenectady. The cathode consists of a tungsten spiral, and the anticathode is also of tungsten. A very high vacuum exists inside the tube which rectifies its own current and can therefore be worked from either direct or alternating supply. Another apparatus shown by Lt.-Col. G. O. Squier was designed to enable the ordinary telephone transmission wires to be utilised as antennae for radio-telegraphy, without any interference of the ordinary working occurring. Dr. E. E. Fournier D'Albe gave a demonstration of his Optophone, to which a separate article in this issue is devoted.

**Venner Signs.**—In the Chancery Division on June 12th, before Mr. Justice Astbury, Mr. F. Russell, K.C., on behalf of Venner Signs, Ltd., had a motion for an injunction to restrain the Stella Signs, Ltd., from selling signs alleged to be an infringement of the Venner patents. He mentioned, however, that having received all the affidavits in the matter, there was such a conflict of opinion as to the facts, that he did not feel justified in asking for an interim injunction. The date of the trial has not been fixed.



## THE NATIONAL PHYSICAL LABORATORY

ON Friday last, on the occasion of the Annual Meeting of the General Board of the National Physical Laboratory at Teddington, the opportunity was given to a large invited party to make an inspection of the Laboratory and its equipment. The guests were received by Sir William Crookes, P.R.S. (Chairman of the Board), Lord Rayleigh (Chairman of the Executive Committee, Sir A. B. Kempe, and Dr. R. T. Glazebrook (Director of the Laboratory).

There are no very striking changes in the buildings or equipment since last year, when, it will be remembered, Mr. Balfour opened extensive new premises, but a detailed inspection revealed an immense amount of progress in matters of detail in the individual departments, immense activity in all the branches, and a continuous broadening in the range of work covered. Among new branches of work may be mentioned the recently introduced radium department, where the British radium standard is kept. It is regrettable that in the annual report it has been found necessary to draw attention to the large financial liability now incurred by the Royal Society in the management of the Laboratory. The income during the past year was nearly £44,000, and the greater part of this sum is received as payment for work done, the Government grant-in-aid for general purposes being only £7,000 a year. The technical societies and institutions represented on the General Board have urged that while it is desirable the control of the Laboratory should remain in the hands of the Royal Society, it is necessary for its proper development that increased Government support should be given, and that steps should be taken to free the Royal Society from the serious financial difficulties that would arise in the event of a falling off in any year in the receipts for work done, and from the necessity of finding the working capital. The matter is now under consideration by the Royal Society with a view to the Government being approached.

Turning now to the electric work carried on at the Laboratory, which is the portion of most interest to our readers, from some points of view the greatest importance attaches to the completion of the determinations of the ohm by the new Lorenz apparatus by Mr. F. E. Smith, who has achieved the hitherto unapproached accuracy of 4 parts in 100,000, and now gives the international ohm as  $1.00052 \times 10^9$  C.G.S. units. Other important work in the electricity section of the physics department has been the extensive international and other comparisons of standard resistances, and further experiments with the standard current weigher. Interest also attaches to the magnetometer equipment, which has been prepared to check that the magnitude of the magnetic disturbances caused by the forthcoming electric working of the neighbouring lines of the L. & S.W. Ry. do not exceed the allowable value. In the section dealing with general electrical measurements, Mr. Campbell has continued during the year his work on the measurement of inductance and capacity at the high frequencies employed in wireless telegraphy, and has evolved satisfactory methods of measuring these over a wide range. He has also been successful in devising means for measuring the power conveyed by high frequency currents. Reference may be made, too, to the researches on magnetisation under large magnetising forces, and special tests of the permeability of the iron wire and strip used for lapping telephone cables to increase their inductance. In addition to all the experimental work, 259 tests have been made in the department during the year.

The electrotechnics department has been working in two senses at very high pressure. The tests made total 3,828 for the year, of which an important part was the testing of apparatus at pressures up to 20,000 volts by the electrostatic wattmeter under Mr. Rayner. A very useful piece of apparatus has been added to the equipment in a 20,000 change-over switch, actuated by cords from the instrument enclosure, so that no time is lost in making three-phase power measurements by the "two wattmeter" method on a single instrument. All the apparatus connected with the standard electrostatic wattmeter is now very conveniently arranged, and this, together with the extraordinary dead beatness and absence of zero creep of the instrument itself render it possible to use this equipment for a very large amount of practical testing work. A good deal of special testing of ebonite has been done for the Admiralty, and other work has included heating tests of field coils and experiments in connection with the E.S.C. specification for supply meters. There has also been a considerable increase in the direct current and resistance measurements under Mr. Melsom, entailing additions to and improvements in apparatus. The research work has included investigations of the heating of wires and cables for the Institution of Electrical Engineers, the work on the heating of buried cables being particularly interesting. Tests of the conductivity of steel rails have also been carried out for the Engineering Standards Committee.

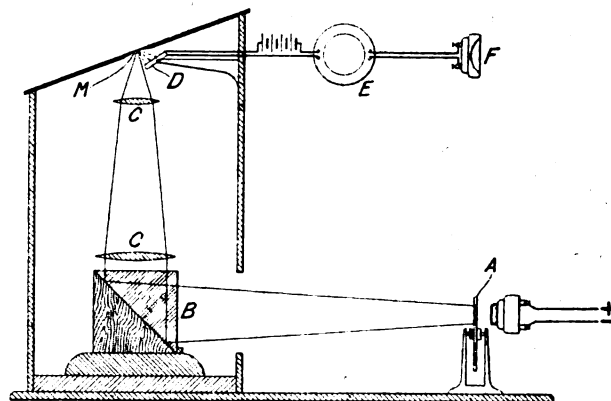
In the photometric division, the inter-comparison of the high efficiency standards of the principal standardising laboratories has been concluded with gratifying results, and other important researches have been advanced by Mr. Paterson and his assistants, including the investigation of certain patterns of so-called

"glareless" head-lamps for motor-cars, and some work on nitrogen-filled "half-watt" lamps, which go in the direction of indicating the range over which the greatest success is to be expected with lamps of this nature. Some interesting differences in the behaviour of tungsten filaments in nitrogen and in vacuo have already been brought out. It appears that although the nitrogen-contained tungsten filament can be maintained at much higher temperatures, its efficiency at any given temperature is not as high as a larger proportion of the energy is taken away to convection. Another matter being investigated is the ratio of mean horizontal to mean spherical candle-power, and the relation of these various properties to the thickness of the filament will bring out some important points.

Space does not permit of a reference to all matters of electrical interest in other departments, but it may be mentioned in conclusion that the metrology department has in hand the standardisation of bayonet socket lampholders.

## THE OPTOPHONE

ON Tuesday, June 16th, at the Conversazione of the Royal Society (Burlington House), an optophone, invented by Dr. E. E. Fournier D'Albe, was on view. This instrument, which is an example of the ingenious combination of the simple laws of optics, electricity, and acoustics, renders it possible for a blind person to read ordinary type by ear. The construction is shown in the diagram. The light from a Nernst lamp passes through the holes in the perforated rotating disc (A), the prism (B), and the lenses (C), which focus it on to the reading desk at (M), in the form of a bright line consisting of five dots giving flashes of different frequencies. The paper to be read is placed print-side downwards on the desk, so that this line of recurring dots falls on to the print, and is reflected back on to the selenium cell (D). The resistance of this varies with the amount of the reflected light. A telephone receiver (F) is connected in



circuit with this cell and a battery, either directly, or through the Brown relay (E) shown in the diagram. As the line of print is moved slowly across the beam, different notes are heard in the receiver, so that with practice it should be possible to visualise each letter as it passes. In the case of the letter L, for instance: when the upright stem of the letter coincides with the beam, no light would be reflected on to the selenium, and the telephone would be almost silent. As the letter gradually passed to the right, all the dots except the lowest would be reflected, and the telephone would emit a composite note consisting of four simple notes corresponding to each of the four dots. When the letter had passed out of range all the five notes would be heard. Once the reader has learnt to recognise the various combinations of notes, any kind of type can be read. The lenses (C) are for focussing the beam of light to suit the different sizes of print.

**Electric Clocks.**—In a lecture given before the National Association of Goldsmiths at Margate, Mr. F. Hope-Jones pointed out that electric time service had been established in spite of the clockmaking trade, and complained that they knew little of the subject, and had actually put obstacles in the way of the use of electricity in connection with clocks. On the Continent, however, this branch of horology was a recognised part of a clockmaker's education. Mr. Jones also remarked that the loss of keywinding contracts due to the adoption of electric clocks was more than compensated for by supervision contracts. There can be no doubt that, given a fair trial, electricity will be able to prove its superiority for this purpose over purely mechanical methods, as it has done in innumerable other instances.

### THE METROHM

A NEW pattern of insulation tester has recently been put on the market by Everett, Edgecumbe & Co., Ltd. (117 Victoria Street, S.W.), under the name of the Metrohm, which has several points of interest. It consists of a 500-volt magneto-generator, and a direct reading ohm-meter, graduated up to 50 megohms in the standard instrument, contained in a single oak case measuring no more than 7 by 8 by 9 in. The complete instrument weighs a little over 16 lb. Its general appearance is seen in Fig. 1.

The generator is at the bottom of the case, and has an entirely separate field magnet system from that of the ohm-meter, and is driven through a train of gearing by

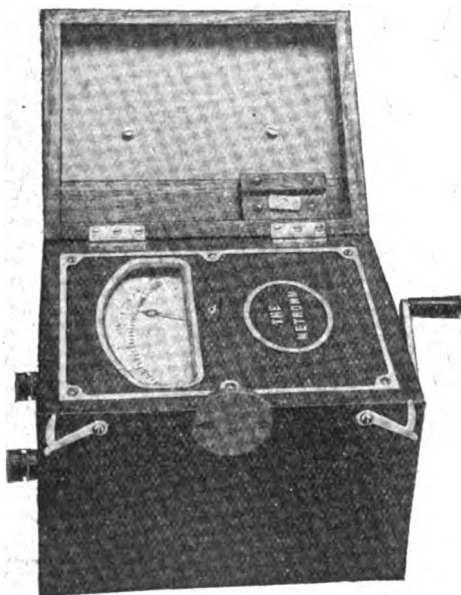


FIG. 1.—THE METROHM.

the detachable crank handle. It is of specially light construction with substantial ball-bearings, and gives 500 volts when the handle is rotated at 100 r.p.m.

The ohm-meter is mounted on the top of the generator. The field is provided by a large permanent magnet of the same general form as used in ordinary moving-coil instruments, and in the air-gap between its poles and the iron core between them swings the coil, which is in series with the generator and the resistance to be measured in the usual way. The other coil is mounted on the top of it, and is connected with its series resistance across the terminals of the generator, and therefore carries a current proportional to the voltage. It is mounted in a vertical plane making an angle of about  $45^\circ$  with that of the current coil, and moves

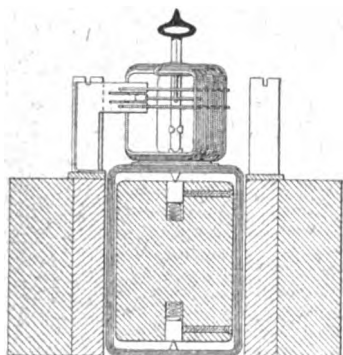


FIG. 2.—DIAGRAMMATIC SKETCH SHOWING ARRANGEMENT OF MOVING SYSTEM OF OHMMETER PART OF INSTRUMENT.

in a very much weaker control field produced by extensions of the main pole pieces without any iron core within it. The relative positions of the coils and pole pieces will be understood from the diagrammatic sketch in Fig. 2. In instruments of this class there is no spring control of the moving system, which takes up its position in the field according to the relation between the current in the two coils, and therefore the value of the resistance to be tested. There are,

accordingly, no control springs, but current is led in by ligaments at the top, which exercise practically no directive force. The arrangement of the pivots is similar to that in the ordinary Everett-Edgecumbe moving coil instruments. The pivots are inside the lower coil at the top and bottom respectively, and bear on jewels mounted in plungers inside the core, which is drilled out to receive them. These plungers have springs behind them which hold them up to the pivots when the coil is put in, but are afterwards clamped in the position determined by these springs by set screws. The arrangement is indicated in the sketch. The pointer is strong but light, and gives easily readable indications on the scale. A particular feature of the instrument is the length (5 in.) of the scale, and its openness at the part, especially between 0.5 and 2 megohms, where accuracy is most desirable. This is accomplished mainly by the shape and proportion of the pole-pieces. The standard instrument is graduated up to 50 megohms, but special ranges can be arranged for. There are only two terminals on the outside of the case, and when making a test all that has to be done is to connect these to the points between which the insulation is to be measured, to turn the handle, and to read the scale. As in the case with all instruments of the ohm-meter class, the reading does not depend on the accuracy of the testing voltage, so that the exact speed at which the handle is turned is immaterial. The pointer is particularly dead-beat in its movement, which conduces to very quick readings.

### CORRESPONDENCE

#### THE I.E.E. INDUSTRIAL COMMITTEE.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—There must be many members of the I.E.E. who have but the vaguest notion of the events resulting in the dissolution of the Industrial Committee, and of the real issue between that Committee and the Council. The last Council Report, the speeches at the General Meeting, and the various references in the electrical Press, all fail to enlighten the rank and file to any material extent, though they indicate some strength of feeling. If the late members of the Industrial Committee consider the matter to be of so much importance to the electrical profession and industry as their utterances indicate, surely it is desirable to get the formal opinion of the members as a body on their proposals, for the guidance of the Council, and of everyone concerned. The constitutional method open to them is that of requisitioning a special meeting to discuss a substantive proposition, and the present time, between the sessions, and before the new President and members of Council assume their duties, is opportune. Before such meeting it is desirable that the Council and the late Committee should jointly issue an agreed statement of the events which resulted in the dissolution of the Committee, that members may have an authoritative foundation for their judgment. I write in the interests of the great majority of members, who have not taken sides, who do not know what is really at issue, but feel that it may be of great importance to the Institution itself, and to all interested in electrical work and progress; and that they are entitled both to full information, and to an opportunity of expressing a considered opinion.

11 Knollys Road, Streatham.  
June 22nd, 1914.

I am, yours, &c.,  
HENRY M. SAYERS.

**Experiments with an Incandescent Lamp.**—At a recent meeting of the Physical Society, some curious experiments were described and exhibited by Mr. C. W. S. Crawley and Dr. S. W. J. Smith. The first of these was due to Mr. Addenbrooke, who, using a 100-volt lamp filled with paraffin oil (after removing the tip) as a convenient high resistance in a 200-volt circuit, noticed that some of the many bubbles forming on the filament behaved in a curious way. Instead of rising at once to the surface from the point at which they formed they ran down the legs of the filament, against gravity, and then escaped at the leading-in wires. Dr. Smith, led to repeat this experiment by Mr. Crawley, discovered another, more striking, phenomenon. Placing the 100-volt lamp in a 100-volt circuit in series with a variable resistance, it was found possible, by momentarily cutting out most of the resistance, to obtain a single bubble upon the wire. The behaviour of such a bubble was very interesting to watch. Instead of escaping at either terminal, as in Mr. Addenbrooke's experiment, it travels backwards and forwards between the two, "looping the loops" of the filament in a fascinating way during every journey. The peculiarities of this phenomenon, which can be obtained with either direct or alternating supply, have been examined, and it has been shown, from the experiments, that a rapid fall of temperature from the wire through the liquid, in the region through which the bubble moves, is an essential condition.

## ANNOUNCEMENTS RELATING TO PATENTS.

Small Prepaid Advertisements with regard to Patents, &c., are inserted on this page, facing our Patent Record, at 1d. per word (minimum 5s.); three insertions for the price of two. Rates for displayed, illustrated, and card advertisements on application.

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HERBERT HADDAN & Co., Patent Agents and Consulting Engineers, 31 and 32 Bedford Street, Strand, London, W.C., beg to call the attention of Engineers, Manufacturers, and others to the following important ENGLISH PATENTS, the Proprietors of which are desirous of arranging by license or otherwise, on reasonable terms, for the manufacture and commercial development of the Inventions in this Country:—

IMPROVEMENTS IN DYNAMO-ELECTRIC GENERATORS. No. 16,729 of 1906.

IMPROVEMENTS RELATING TO DYNAMO-ELECTRIC MACHINES. No. 13,330 of 1910.

IMPROVEMENTS IN ELECTRIC LOCOMOTIVES. No. 7,750 of 1908.

For particulars, mentioning number and year of the Patent, address HERBERT HADDAN & Co., Patent Agents and Consulting Engineers, 31 and 32 Bedford Street, Strand, London, W.C.

The Proprietor of British Patent No. 14,383/1910, covering an invention relating to ELECTRIC FIRE ALARMS, is desirous of entering into negotiations for the Sale of the Patent rights or the granting of licenses.

All communications to:—Messrs. PHILLIPPS (Robert E. Phillipps, M.I.Mech.E., Assoc. M.Inst.C.E., and A. Millward Flack, Fel. Chart. Inst. P.A.), 70 CHANCERY LANE, LONDON.

Patent 9,447/13 enables RESISTANCES with large number of contacts, suitable for dimming lights or motor regulation, to be made in compact and inexpensive form. Nothing on the market is as small or efficient. Large sale certain at remunerative prices. Royalty rights or sale outright offered. Alternatively capital required for working. Model can be seen. MANSELL, 13 Cecil Court, London, W.C.

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British Patent 10,605/1912 is for sale for the purpose of immediate manufacture of the patented article. Particularly suitable for HARDWARE or ELECTRICAL FACTORIES. Offers to F. C. A. 485, c/o RUDOLF MOSSE, Frankfurt-on-Maine, Germany.



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·550	0·5 lag.	·99 <sub>8</sub>	·99 <sub>3</sub>
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# "ELECTRICAL ENGINEERING" PATENT RECORD

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## Specifications Published June 18th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

**12,115/13. Metallic Conduit Fittings.** SIMPLEX CONDUITS, LTD. An improved form of fitting particularly applicable to ceiling roses. It consists of a metallic box and cover with separate insulating block, which can be removed from the box for connection to the lamp wires. The latter are passed over a rubber ring, which is contained in the top of the block so that an elastic support is obtained. The lower part of the block is made cylindrical, and protrudes slightly through the cover, thus preventing accidental contact of the wires with the cover. Nine figures.

**15,014/13. Heating Units.** L. W. CAMPBELL. A series of mica washers is mounted upon a central supporting rod, and compressed into a solid mass. A thread is then cut upon the resulting bar, and high resistance wire is wound in the grooves of the thread, one end of the wire being connected to the central supporting rod, and the other to a metal sleeve which is mounted upon one end of the insulating bar. A compact and durable heating unit is thus formed. Seventeen figures.

**18,018/13. Telephone Transmission Lines.** WESTERN ELECTRIC CO. (F. T. Woodward). A method of constructing an artificial line to correspond with, or balance, a loaded transmission line. The principle upon which this method depends may be stated thus: The impedance of a long, periodically-loaded transmission line, beginning at the fractional part 0.17 to 0.20 section, may be approximated to, at frequencies below the critical frequency, by a three-branch network consisting of a constant resistance in series with a combination consisting of a capacity in parallel with a high time-constant inductance. If  $L$  and  $C$  are the inductance and capacity, respectively, of the transmission line, the values of the resistance, inductance, and capacity of the artificial line should be  $\sqrt{L/C}$ ,  $0.3 L$ , and  $0.53 C$  respectively. Further particulars are given to suit cases where the loaded line does not begin at about 0.2 section. Three figures.

## Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** B.T.-H. Co. (G.E. Co., U.S.A.) [Vapour lamps] 15,392/13.

**Dynamos, Motors and Transformers:** OTIS ELEVATOR CO. (Otis Elevator Co., U.S.A.) [Motor control] 15,682/13; BOUCHEROT [D.C. transformers] 19,588/13; STORER [Regenerative braking] 21,140/13; SIEMENS BROS. DYNAMO WORKS, LTD., and WILSON [Rotary converters] 29,270/13; SIEMENS SCHUCKERT. GES. [Poly-phase motor regulation] 1,640/14, [Motors for ship propulsion] 4,309/14.

**Electrometallurgy and Electrochemistry:** CRAFTS [Shaft furnaces] 18,073/13.

**Heating and Cooking:** FREAS [Constant temperature ovens] 12,740/13; BRITISH ELECTRIC HEATER CO. and KRATT [Heater for liquids] 16,601/13; RAILING and IDE [Ovens] 17,264/13; SPRENGER [Heaters] 8,719/14.

**Ignition:** WOLF [Engine starters] 26,502/13.

**Incandescent Lamps:** GLADITZ [Manufacture of tungsten] 12,421/13.

**Instruments and Meters:** ELSTER [Electricity meters] 5,157/13; EVERSHED & VIGNOLES, LTD., and EVERSHED [Insulation testing] 12,723/13, 12,032/14; FURSTENAT [Röntgen-ray meter] 29,831/13.

**Storage Batteries:** WEEKS [Accumulators] 26,251/13; SVENSKA AKKUMULATOR AKTIEBOLAGET JUNGNER [Alkaline accumulators] 72/14.

**Switchgear, Fuses and Fittings:** HIGGINS and GRIFFITHS [Ceiling fitting] 18,400/13; JEIDEL [Thermal contact] 3,818/14.

**Telephony and Telegraphy:** SOLDATENCOW [Perforator] 5,352/13; AUTOMATIC TELEPHONE MFG. CO. (Automatic Electric Co.) [Telephone systems] 10,200/13; PLECHER [Telephones] 10,399/13; LUND and NEW PHONOPORE TELEPHONE CO. [Telegraph or telephone calling device] 12,966/13; DITCHAM & GRINDELL-MATTHEWS WIRELESS TELEPHONE SYNDICATE, LTD. [Wireless alarm apparatus] 13,065/13; HEYL and BAKER [Wireless apparatus] 18,024/13; WESTERN ELECTRIC CO. (Woodward) [Telephone receiver] 25,643/13; FITZGERALD and FITZGERALD [Telephone call meter] 27,137/13.

**Traction:** WHITE (Sturges) [Electric railways] 15,658/13.

**Miscellaneous:** STIBBE [Knitting machines] 16,349/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires, &c.:** SIEMENS SCHUCKERT. GES. [Tightening overhead conductors] 13,213/14.

**Dynamos, Motors and Transformers:** GRAEMIGER [Motors] 8,699/14; FIORANI [Dynamo-electric machines] 11,159/14; OTTO [Converter] 11,561/14; CIE DE L'INDUSTRIE ELECTRIQUE ET MÉCANIQUE [Dynamo electric machines] 13,159/14.

**Incandescent Lamps:** WESTINGHOUSE METALLFADEN GLUHLAMPEN FABRIK [Lamp manufacture] 12,358/14, 12,359/14.

**Switchgear, Fuses and Fittings:** FELTEN UND GUILLAUME CARLSWERK AKT. GES. [Circuit breakers] 12,934/14.

**Telegraphy and Telephony:** BETULANDER [Automatic and semi-automatic systems] 6,210/14; GILES [Condensers] 10,895/14.

**Traction:** SIEMENS SCHUCKERT. GES. [Cooling of electric locomotives] 25,497/13.

**Miscellaneous:** SONTOG [Talking machines] 12,666/14.

The following Amended Specifications may now be obtained:—

**Distributing Systems, Insulating Materials, &c.:** B.T.-H. Co., LTD. (G.E. Co., U.S.A.) [Insulating material], 3,566/13.

**Incandescent Lamps:** A. JUST [Tungsten filament manufacture] 4,034/13.

**Miscellaneous:** R. IMME [Typewriter], 4,405/13.

## Opposition to Grant of Patents

**13,282/12. Manufacture of Ductile Masses of Tungsten, &c.** DR. ING. P. SCHWARZKOFF, S. BURGSTALLER, and WOLFRAM LABORATORIUM DR. ING. P. SCHWARZKOFF. The Comptroller has allowed the grant of this Patent notwithstanding the opposition raised. (See ELECTRICAL ENGINEERING, May 28th, 1914, p. 295.)

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

**11,562/00. Mercury Vapour Lamp.** P. COOPER HEWITT. The body of the lamp consists of a long glass tube with the upper end enlarged to form a cooling chamber. The anode is of pure iron and the cathode of mercury. The leading-in wires are of platinum fused into the glass body at each end. A small quantity of sulphur is introduced into the cathode mercury, to facilitate the starting of the lamp. In constructing the lamp, the mercury is heated before the lamp is sealed off, and a potential is applied to the terminals, so that the mercury is vapourised and all other gases which may be occluded in the anode or cathode are driven out. The tube is then hermetically sealed. The internal pressure when cool should be from 2 to 8 mm. A thin metallic band is fixed on the outside of the tube near the anode, and is electrically connected to the cathode, its object being to facilitate the starting of the lamp. An induction coil may be used for obtaining the high initial voltage necessary for starting. A lamp  $\frac{3}{4}$  in. dia.  $\times$  57 in. between electrodes with a condensing chamber  $2\frac{1}{2}$  in. dia. requires about 3 amps. at 110 volts. Five figures.

**11,835/00. Pneumatic-Electric Control.** E. R. HILL. A system of motor control by which all the controllers on an electric train can be operated synchronously. The operating handle of the master control can be turned so as to complete the circuits of electromagnets which admit compressed air to the cylinders which operate the reversing switches of the several motors. Another movement of the operating handle energises the electromagnets, admitting air to the cylinders which move the motor controllers one notch forward. The circuit is then automatically broken and remade, so that the above operation is repeated and the controllers move forward step by step to their "on" positions. When the brakes are applied, the power circuits are simultaneously and automatically opened. Sixteen figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** A.E.G. [Titanium oxide and iron electrodes] 4,762/08.

**Dynamos, Motors and Transformers:** C. A. PARSONS [Armature winding] 5,374/02; MORGAN CRUCIBLE CO. and C. W. SPIERS [Brush holders] 5,167/06; N. W. STORER [Commutator connections] 3,831/09; B.T.-H. Co. (G.E. Co., U.S.A.) [Rotary transformers] 5,119/09, 5,209/09; F. BURKS [Magneto machines] 8,489/09.

**Electrochemistry and Electrometallurgy:** H. BIRKBECK (C. G. Hoffmann) [Tempering metals] 5,124/08.

**Heating and Cooking:** C. RUZICKA [Resistance material] 4,657/08.

**Ignition:** R. BOSCH [Spark plug] 15,985/09.

**Storage Batteries:** J. E. G. MÉRAN [Magnesium silicate casing for plates] 5,366/02.

**Switchgear, Fuses and Fittings:** R. H. W. KNIGHT and L. NAGEL [Metallic conduits] 5,240/03.

**Miscellaneous:** F. J. KING [Magnetic separator] 5,209/02; F. BURKS [Improving magnetic qualities of cast-iron] 5,360/09.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,397.

A fault occurs on a 7/16 3-core paper, lead-covered and armoured cable 300 yds. long, laid direct. On testing, it is found that each core has gone to earth, and also burnt clear from the remaining portion of the cable. Two-thirds of the cable is in the middle of a road at a depth of 3 to 5 feet, the remainder under paving-stone in the pathway. State the most reliable test for locating this fault to avoid opening up as much as possible.—"ADSUM."

(Replies must be received not later than first post, Thursday, July 2nd.)

### ANSWERS TO No. 1,395.

A three-phase slip ring motor controlled by a reversing type controller, drives a tramcar, and in coming down a steep incline the car runs away and the brakes refuse to act. Can the motor when driven up to or above synchronous speed by the momentum of the runaway car be utilised as an induction generator feeding back to the line, and act as a brake on the car? In what position should the controller be put, i.e., to run the motor in the same direction of rotation or to reverse it, and to get the maximum brake effect as an induction generator should all resistance be cut out of rotor circuit? What is the relation of brake effect and speed of motor under such conditions? What would be the effect of attempting to reverse the motor while the car was running away.—"PUZZLED."

The first award (10s.) is made to "DARNOC" for the following reply:—

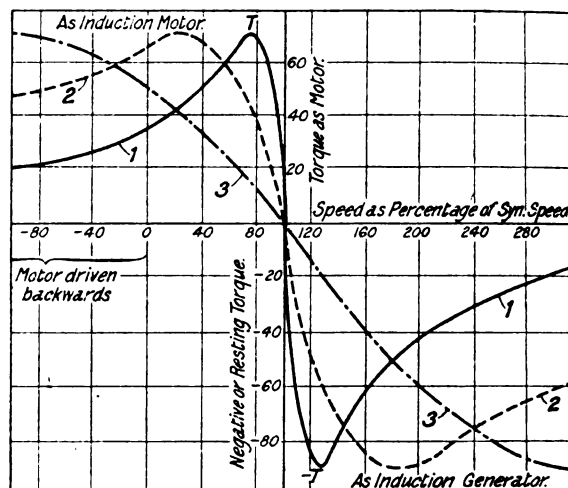
When an induction motor is driven above synchronous speed by external means the motor acts as an induction generator, and supplies power to the line.

To make use of this property of the machine, to obtain a braking effect, the controller should be kept in the forward position. To obtain the maximum braking effect some resistance should be cut into the rotor circuit; the amount of this to obtain maximum resisting torque depending on the speed which the motor has attained over synchronism, the resistance being reduced as speed gets nearer synchronism. The reason for this is shown in the attached "speed-torque" curve. It will be seen that the induction generator characteristic is somewhat similar to the characteristic of the machine as an induction motor, but of the opposite sign, and it will be seen that a point of maximum resisting torque is reached (which corresponds to the "pull-out" point of the machine running as an induction motor).

The effect of cutting-in rotor resistance is to move this point further away from synchronism, the speed above synchronism (or negative slip) being proportional to the total resistance in the rotor circuit (i.e., internal and external). The object, therefore, of cutting-in resistance into the rotor circuit is to obtain this maximum resisting torque at the speed at which the motor is being driven.

Referring now to the effect if the controller be put into

the reverse position, this will be the same thing as if the motor were driven backwards; it is shown on the curve that a torque will be developed, and as the machine is reversed, this will be a resisting torque, but this will not be as great as in the preceding case, and, further, the braking effect



### REFERENCE.

- 1 = Without Rotor Resistance.
- 2 = With two different Values of
- 3 = Rotor Resistance in Circuit.
- T = Points of Max. Torque.

will be obtained by means of the motor absorbing power in its own windings (and in the rotor resistance if this is in circuit). This is obviously very undesirable, especially as large currents are induced in the rotor windings with consequent probable damage.

The second award (5s.) is given to "A. L.," who writes as follows:—

This question deals with the possibility of regenerative control for induction motors. Any induction motor, if run above synchronous speed, will act as an induction generator, provided that its terminals are connected to a suitable A.C. supply to provide the exciting current necessary to maintain the rotating field, as this form of generator is not self-exciting. A special feature of the induction generator is that it is "asynchronous," or that its frequency is independent of the speed, and is determined by the frequency of the supply to which it is connected. The output as a generator is proportional to the slip or difference between actual speed and synchronous speed for small values of slip, say up to 9 or 10 per cent. slip, thus being similar to the induction motor. In the question the driver of the car has apparently brought his controller to the "off" position on a down grade, and attempted to apply his brakes and found the latter inoperative. Meanwhile, the car has been gathering speed, and is now running away, i.e., travelling above full speed, and still speeding up. If he notch up his controller in the "forward" direction he will make use of the generator action of his motor to brake the car. This action will be strongest when he is in "full forward" with all rotor resistance cut out, the current carried by the stator then being a maximum. It must be noted, however, that it is impossible to stop the car by this means, as the braking action only persists so long as the car is travelling above its maximum speed. The braking will be proportional to the output as a generator, hence to the slip, and a point of equilibrium will be reached at about 5 per cent. overspeed, at which the motor will hold the car. To stop the car, however, it will be necessary to reverse. This is effected by interchanging two of the three phases. The phases interchanged represent a "short" on the lines, but owing to the inductance of the motor, full volts, applied to the stator, with rotor shorted and standing, results in about 5-6 times normal full-load current passing through stator. Owing to the generator action, though, when motor is running above synchronous speed, this would be nearly doubled, but the first reverse notch of the controller inserts all the rotor resistance, reducing the short-circuit current by about 50 per cent. The motor overload protection may be fuses which should carry this current for a minute or two, whilst car is pulling up, or overload switches. If the latter are set too lightly, then wedge the trip coils.

## ELECTRIC TRACTION NOTES

The Bill promoted by the Metropolitan & Great Northern Railway Companies which sought powers jointly, to work the Great Northern & City Railway, to link up that line with the City & Waterloo Tube Railway at the Bank, and also to link up with the Metropolitan & District Railways, has been withdrawn by the promoters. It has been under consideration for several days by a House of Commons Committee, who passed the preamble subject to certain conditions which the promoters regarded as too onerous. These conditions included a compulsion to electrify the connecting lines between the Great Northern & North London systems between Finsbury Park and Canonbury, and that no goods traffic be allowed upon the Great Northern & City Railway.

The Annual Congress of the Tramways and Light Railways Association will be held at Newcastle on July 16th and 17th. The following Papers are down for reading:—"Some Features of Newcastle Corporation Tramways," by Mr. R. Mayne; "Tramway Experiences in Brazil," by Mr. H. M. Sayers; "Standard Tram Rails," by Mr. F. Bland; "Rail Joints," by Mr. R. Humphries; and "Town Planning," by Mr. J. A. Brodie.

A proposal that the Aberdeen Corporation should purchase the Aberdeen Suburban Tramways Co. has been received with favour by the majority of the members of the Corporation.

At the meeting of the British Electric Traction Co. last week Mr. E. Garcke, who was in the Chair, announced that the year's net revenue of all the federated companies amounted to £1,200,000, after paying all working expenses, of which the B.E.T. Co. received about £200,000. The yield on their investments was 4.47 per cent., as compared with 4.11 per cent. for the previous year. This, he said, was higher than for many electrical undertakings. A scheme for rearrangement and reduction of capital is under consideration.

At a meeting last week of the Underground Electric Railways Co. of London, resolutions were adopted converting the Company formally into a share and securities holding company. Sir Edgar Speyer said that the Company had long

completed the constructional work that it undertook, and had disposed of its power-house to the Metropolitan District and London Electric Railways Co.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The final report of Mr. G. Franklin, the liquidator of the National Telephone Co., states that the deferred shareholders have been repaid their holding at par plus a premium of 5.48 per cent. The expenses of the arbitration proceedings and liquidation are equivalent to 1.32 per cent. of the total amount realised.

The liner *Royal George* has been equipped with the Marconi-Bellini-Tosi wireless compass, or radio-gonometer, by which she can find her position when within fifty miles of a wireless station, and can tell accurately the bearings of ships from which signals are received. The steamer *Eskimo*, plying between Hull and Christiania, has been using this apparatus for some months.

The net profit for the year of the Marconi International Marine Communication Co. is £37,029, against £24,496 for the previous year. The Company owns and works 873 public stations on the high seas, and there are now some 2,000 merchant ships fitted with Marconi apparatus. A final dividend, making 10 per cent. for the year, is recommended.

A wireless station has been opened on the Island of Waigatsch, near Archangel, in the Arctic Ocean.

The wireless stations at Tobermory and Lochhoisdale have been temporarily closed.

It is reported that the breakage of a cast-iron telephone pole by collision with a van caused no less than seventeen adjoining poles to be brought down at Brighton last Friday.

Deferred telegrams for Bolivia are now accepted "via Colon."—The Heliograph station between Ponta Padrao and Soca Province of Angola is interrupted.—The only offices which can now be reached via Libreville Loango are Landana, Cabinda, Lela, and Soca.—Defective lines beyond Adana and Sivas cause delay to telegrams for Syria and Irak.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 377. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**STEAM TURBINES.**—The latest list of Curtis steam turbines issued by the British Thomson-Houston Co., Ltd. (Rugby) contains particulars of several hundred turbines aggregating 384,594 kw. sold by the company up to April 30th last.

**CHLORIDE ACCUMULATORS.**—Some interesting particulars of the varied uses to which accumulators have been successfully applied are to be found in a pamphlet recently issued by the Chloride Electrical Storage Co., Ltd. (Clifton Junction, Manchester). Charts are reproduced showing how a battery of accumulators in conjunction with a booster may be used to remove the load fluctuations from a generator, thus enabling a high efficiency to be attained. Other cases in which a battery has been found advantageous, such as, for the operation of a swing bridge, locomotives for tunnel excavating, and railway platform trucks, are also mentioned.

Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."

**ACCUMULATOR CARS.**—Edison Accumulators, Ltd. (2 and 3 Duke Street, Piccadilly), have issued an attractive new catalogue of private passenger cars driven by Edison batteries. The chassis is manufactured by Arrol-Johnstone, Ltd. (Paisley and Dumfries), and is arranged with part of the battery in front and part in the rear. A single motor is employed driving through a worm and differential. Some very handsome bodies are illustrated, ranging from the small three-passenger standard coupé, which many of us have seen on the road, to commodious domed limousines representing the last word in luxury and elegance.

**WIRELESS TIME SIGNALS.**—The compact wireless receiving set known as the Horophone, by the aid of which the time signals from Paris and Norddeich can be picked up, is illustrated in a new booklet from the Synchronome Co., Ltd. (32 and 34 Clerkenwell Road, N.). Instructions are also given for the interpretation of the weather reports which are sent out from Paris each day.

**ILLUMINATION.**—An attractive little folder just issued by the British Thomson-Houston Co., Ltd., entitled "Economy by Reflection," deals with the use of scientifically designed shades and reflectors, and lists reflectors of the Veluria, Holophane, Opalux, and Sudan types of glassware. These holders can be overprinted with contractors' names and addresses.

**THE BRUSH BUDGET.**—A number of motor-generator sets and motors for special purposes, and some examples of cotton-mill drive are illustrated in the May number of the Budget of the Brush Electrical Engineering Co. (Loughborough).

**CONDUITS.**—A new leaflet, giving prices of conduits and conduit fittings, has been issued by Krupka & Jacoby, Ltd.

**IRONCLAD SWITCHGEAR.**—A leaflet from J. H. Holmes & Co. (Newcastle) deals with high-tension ironclad switchgear of the draw-out type for mining and sub-station work. This is of very substantial construction, and is fully interlocked.

**BELLS AND ACCESSORIES.**—A comprehensive new catalogue of electric bells, batteries, pushes, and other accessories has been issued by the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex). A very complete range of apparatus is dealt with.

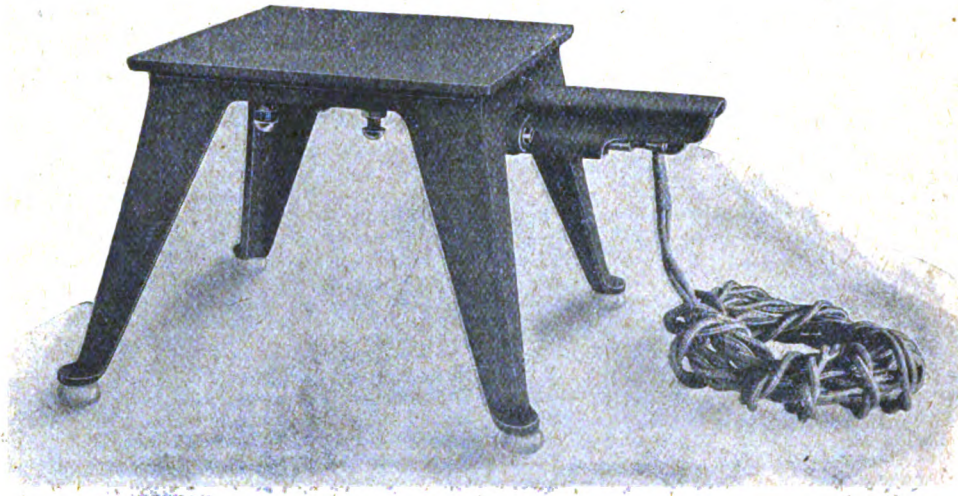
**INSULATING MATERIAL.**—A folder from Carson & Evans (3 Fenchurch Buildings, E.C.) calls attention to their special Carvanite insulating material, which is claimed to have superior qualities to ebonite at a lower price.

**THE "E.C. JOURNAL."**—The June issue of this illustrated journal, published by the Electrical Co., Ltd., contains an article on electric chicken incubators and description of various parts of the factories in which the Company's products are made, with some notes on the latest developments in polyphase meters.



### THE CALORITE COOKING STOVE

THE form of electric stove illustrated here has recently been introduced by the British Thomson-Houston Co., Ltd. (Rugby), and is the result of considerable experience in the manufacture of heating devices. It can be used for boiling water, and several other simple cooking operations. The machined face of the hot-plate is  $6\frac{1}{4}$  in. square, and is

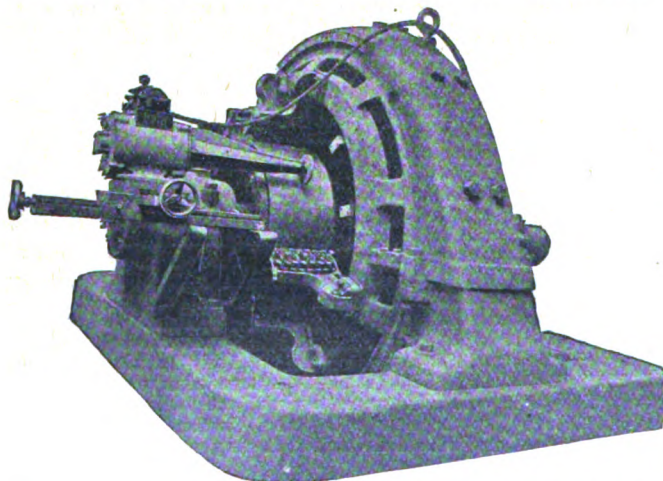


THE CALORITE ELECTRIC STOVE.

clamped to a frame standing on porcelain feet. The heating element, which consumes 1,000 watts, is of the special Calorite alloy, which withstands oxidation up to a very high temperature, and has a melting point of  $2,800^{\circ}\text{F}$ . The terminals are substantially made and well protected. A pint of water can be boiled in eight minutes, starting with the stove cold, or five minutes if the stove is hot.

### COMMUTATOR GRINDING

APPARATUS for commutator grinding is sometimes fitted with an automatic feed arrangement, but there are many cases where the expense of this is not justifiable, and non-automatic apparatus is preferable. For such work the Witton-Kramer Electrical Tool and Hoist Co., Ltd. (Witton, Birmingham), for whom the General Electric Co., Ltd. (67 Queen Victoria Street, London, E.C.), are the sole selling agents, supply a special pattern of long-snout grinder. One of these is shown in the accompanying illustration grinding the commutator of a 750-kw. rotary converter. The method



WITTON-KRAMER GRINDER IN USE ON COMMUTATOR OF 750 KW. ROTARY CONVERTER.

of fixing the grinder is very simple. The bolts for the bearing cap are slackened, and a pair of suitably bent angle irons inserted between the bearing cap and the pedestal, the bolts being screwed down again tightly to hold the angle irons, which are cut away to receive the bolts. The slides for the

grinders are bolted on the horizontal platform formed by the two angle irons. The grinder has the usual two motions. The whole arrangement is very rigid and gives a true surface to the commutator. On account of the simplicity of the arrangement it is possible to equip a generator or motor with this grinder in considerably less time than an automatic machine would take. When the distance between adjacent brush sets is small, it is necessary to remove one set of

brushes. In the illustration, the second set has been removed so as not to obstruct the view of the grinding wheel. Special arrangements for driving the armature at reduced speed are generally unnecessary, and it is sometimes possible to undertake the grinding with the machine on load. A special insulating grinding wheel is available for this purpose, so that no danger of earthing exists. Also the wheel can be fixed to grind at the point of zero potential. Rotary-converters with starting motors can be run off the starting motor during grinding, or can be driven from the continuous-current side at either full or reduced speed; while generators can be driven from the engines or run from the bus-bars as motors.

### BASTIAN METERS

IMPORTANT reductions in the price of Bastian meters have been made, which should help considerably to reduce the cost of connecting up cottages and small houses. We are informed that every meter made by the Bastian Meter Co. is guaranteed to start on and to register correctly the current consumed even by a 10 watt lamp, and even a leak on the house wires is recorded. With the present tendency towards cheaper units and higher efficiency lamps this question of starting current becomes more and more important, and should be taken into very careful consideration when the meter problem is being considered. Another great advantage claimed is that there is nothing to wear out, or to require periodical adjustment. The prices now range from 10s. 6d. for the 3 ampere meter to 15s. for the 5 ampere instrument. These meters are usually selected so as not to require resetting more than once a year on the average, and the makers do not claim that the Bastian meter is suitable for every class of consumer, but only for most small consumers.

**R.A.C. Motor-car Accessory Trials.**—We have received a long letter from Rushmore Lamps, Ltd., dealing with the nature of the trials of motor-car accessories organised by the Royal Automobile Club. The firm assert that the weak point from the users' point of view of these trials is that the Club direct their attention only to points in the apparatus tested which the makers desire to be tested, and that weak points are liable to be missed in this way. They suggest that the Club should have a freer hand to investigate any points that they like in the apparatus submitted, and express their willingness to submit one of their engine-starter and lighting equipments to be tested on the Club's own conditions.

**The New Pirelli Cable Works.**—Two illustrations in the *Southampton and District Pictorial* show views of the western shore at Southampton in 1774 and 1914 respectively. In the latter the new Pirelli cable works is shown to be rapidly approaching completion.



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Beckenham.**—Tenders are to be invited for an evaporative condenser and one 120-kw. D.C. generating set.

**Oldham.**—Further generating plant is to be purchased at a cost of about £40,000, in view of the increasing power load.

**Rawtenstall.**—The Local Government Board has sanctioned a loan of £99,900 for the electricity undertaking, and a separate loan of £1,000 for electric street lighting.

**Rochdale.**—Tenders are invited for a wet air filter by July 1st. Particulars from Mr. C. C. Atchison, Electrical Engineer, Dane Street, Rochdale.

**Southport.**—Electric fans will probably be required for the ventilation of the Market Hall.

**Walsall.**—A Local Government Board inquiry was held last Thursday regarding an application for a loan of £74,850 for a new electricity works.

### Wiring

**Manchester.**—Tenders are invited for electric lighting installation at Mill Street Industrial Day School, Ancoats. Particulars from Secretary, Education Office. Tenders by June 30th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bath.**—Drill hall, &c. Lower Bristol Road, Bath. Architect, A. J. Pictor, Bruton.

**Cornholme.**—Cinematograph theatre. Architect, J. E. Stote, Bridge Street, Todmorden.

**Gillingham (Dorset).**—New post office. H.M. Office of Works.

**Liverpool.**—Cinematograph theatre in Lime Street.

**London: Tooting.**—Extensions to Tooting Bee Asylum. Architect, T. W. Aldwinkle, 20 Denman Street, London Bridge, S.E.

**Stoke Newington.**—Extensions to Town Hall.

**Margate.**—Extensions to children's hospital. Architect, T. W. Aldwinkle, 20 Denman Street, London Bridge, S.E.

**Middlesbrough.**—Elementary school at Grove Hill.

**Radcliffe.**—New premises, Manchester County Bank. Architects, Mills & Murgatroyd, 23 Strutt Street, Manchester.

**Sleaford.**—Isolation hospital.

**Torquay.**—New theatre. Architect, F. G. Moore, 9-10 Fleet Street, Torquay.

### Miscellaneous

**London.**—Tenders for a three years' supply of electrical accessories are invited by H.M. Office of Works by Sept. 1st. (See an advertisement on another page.)

**Norway.**—The Norwegian State railway invite tenders by June 29th for electric clocks for the Narvik district. Particulars from Distriktschefens Kontor, Norges Statsbaner Narvik. Local representation required.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Lossiemouth.**—A contract for wiring the Town Hall, Court Room, and Library has been given to Primrose & Primrose at £42, including plain fittings.

**Rugby.**—The tender of W. T. Henley's for a supply of cable has been accepted.

Siemens Bros. Dynamos Works, Ltd., have obtained a contract for twelve months' supply of Tantalum lamps for ship lighting and Wotan lamps for office lighting from the Royal Mail Steam Packet Co.

## APPOINTMENTS AND PERSONAL NOTES

We refer this week to the Knighthood which has been conferred upon Mr. J. F. C. Snell, President-Elect of the Institution of Electrical Engineers. There was a number of other honours included in the Birthday Honours List which are of some interest to the electrical industry. Sir J. W. Benn, who was so intimately connected with the initiation and development of the London County Council Tramways, has been created a Baronet, as also has Sir Joseph Beecham, who for many years has been, and still is, Chairman of the St. Helen's Electric Lighting Committee. Mr. Albert H. Stanley, Managing Director of the Underground Electric Railways Co. of London, and of the London General Omnibus Co., has been made a Knight.

On Friday afternoon the staff and employees of the Walsall Corporation Electricity Department took their formal farewell of Mr. A. S. Barnard, the Borough Electrical Engineer, who is severing his connection with the Corporation at the end of the present month, and asked his acceptance of a suit-case and a silver rose-bowl for Mrs. Barnard.

Mr. H. A. Howie, who has been appointed Electrical Engineer at Walsall, has been presented with a silver tray and pipe by his colleagues at Sheffield, where he has been in the Electric Supply Department for five years.

Mr. E. Jackson, of Guildford, has been appointed Third Engineer-in-Charge at Bermondsey out of 100 applicants.

The salary of Mr. T. Hall, Borough Electrical Engineer, Burton, has been raised from £275 to £400 per annum, and that of Mr. A. B. Slater, Tramways Manager, from £200 to £220. The salaries of four of the Charge Engineers have also been increased.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £63 5s. to £63 15s. (Last week, £64 to £64 10s.)

**Bankruptcies.**—A second and final dividend of 9d. in the £ is declared in the bankruptcy of T. L. Callender, of Nottingham, Electrical Engineer.

**Change of Address.**—Krupka & Jacoby, Ltd., are removing their offices and stores to 39 Victoria Street (Goods Entrance, Old Pye Street), Westminster. The telegraphic address will still be "Acromion," but the new telephone numbers will be Victoria 6644 and 6645.

**Successful Claim for Commission.**—Messrs. Lindeck, Cahn & Co., stockbrokers, were successful in the action heard by the Common Serjeant last week for commission from the Dubilier Electrical Syndicate in respect of an introduction to the General Electric Co., who have acquired rights under some of the defendants' patents for high-frequency apparatus.

**CAPPER PASS & SON, Ltd.,**  
Bedminster Smelting Works, BRISTOL  
SELLERS OF  
**ANTIMONIAL LEAD OF ALL GRADES**  
BUYERS OF  
**LEAD ASHES & LEAD RESIDUES FROM ACCUMULATORS**  
Telegrams: "PASS, BRISTOL." Telephone: 8475 & 8476.

**BLAKE & INSULATING STAPLES**  
Write for Samples and Prices.  
**MOSSÉS & MITCHELL,**  
Olliswell Works, 122-124, GOLDEN LANE, E.O.



## LOCAL NOTES

### **Belfast:** *Linking-up of the Traction and Lighting Supply.*

—The installation of converting plant is recommended in a report by Sir John Snell to link up the lighting and traction plant, so that each can help the other on peaks, as being preferable to the putting down of a battery which had been proposed. This would entail a saving of about £7,500 over the battery scheme.

**Blackpool:** *Interruption of Supply.*—Last week the bursting of a main steampipe in the station caused an interruption of supply to the lighting and tramways for over half-an-hour. Nobody in the station was injured.

**Blackrock:** *New Power Station.*—The proposed site for a new electricity works has not been agreed to by the Local Government Board, who have signified, however, that on a competent engineer's favourable report and with the approval of the Board of Trade they will reconsider the matter.

**Colwyn Bay:** *Destructor Scheme.*—Mr. E. M. Lacey's suggested scheme for a destructor generating plant at Brouyant has been adopted, and he has been appointed to carry it through.

**East Grinstead:** *Electric Supply Scheme.*—A special meeting of the Council last week had under consideration a proposal for the inception of an electric supply scheme in connection with the refuse destructor which is about to be constructed. A Committee was formed to go into the matter, which is to be reported on by Mr. J. B. Morgan, Electrical Engineer to the Horsham Council.

**Ellon:** *The Lighting Scheme.*—The proposed agreement between the Council and the Company for an electric supply to the Borough, has been unanimously agreed to by the Council.

**Glasgow:** *A Peculiar Accident.*—In making excavations for a drainage gully last week a workman struck a conduit carrying cables with his hammer and caused a serious short-circuit, and was rather badly burned. A temporary interruption to the supply of a small section of the network was caused, but the damage was soon repaired.

**Lynn:** *Electricity Accounts.*—A net surplus of £876, which remains after meeting all capital charges, is to be applied to reduction of capital.

**Middlesbrough:** *The Profit on the Electricity Undertaking.*—In view of the net profit on the undertaking of £3,814, the small consumers, who pay 4d. per unit while the average price received is 1'68d., consider themselves hardly used.

**Morecambe:** *Illuminations.*—The Engineer is to prepare a scheme for illuminating the front during a fishing festival in September; the Committee which is developing the advertising of the place will ask the Corporation to supply current free.

**Rugby:** *Electricity Accounts.*—A profit of £800 has been made on the electricity undertaking, which now supplies about 400,000 units per annum.

**Shrewsbury:** *Electricity Accounts.*—A final surplus of £127, as against £98 for the previous year, is reported.

**Truro:** *Proposed Electric Supply Scheme.*—A public meeting has been held to consider a scheme explained by Dr. Purves, Consulting Engineer to the Council. There is opposition by the local gas interests.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**General Electric Co.** The directors report net trading profits of £157,893, with £32,331 brought forward. After payment of debenture interest and preference dividend and allocating £24,328 to depreciation and removal expenses, an available balance of £133,896 remains. Of this, £14,000 is absorbed by expenses of new issue of capital. £30,000 is recommended to be placed to reserve, £13,156 to bonuses and staff benevolence. Finally, a dividend of 10 per cent. is recommended on the ordinary shares, with £36,739 carried forward. The meeting will be on July 2nd.

**Aron Electricity Meter.**—A dividend of 7 per cent. is recommended on the ordinary shares, with £15,000 carried to reserve. The meeting will be held on June 30th.

**Victoria Falls & Transvaal Power.**—A profit of £467,823 is reported, an increase of £21,444 over that for the previous year. The interest charges and depreciation contributions are, however, larger, so that the net available balance (£225,198) is only £9,831 in excess of last year. The 6 per cent. dividend on the preference shares is paid, but these are still 6 per cent. in arrear. The extension of plant will, however, soon be at work.

**Consolidated Diesel Engine Manufacturers.**—A petition for the winding up of the Company has been presented, and is down for hearing on June 30th. The shareholders have been notified of a meeting to consider a resolution for the voluntary winding up of the Company, with Sir W. Peat as liquidator. There have been some difficulties in the underwriting of a scheme for fresh capital, but if these are overcome in time it will be open to the shareholders not to proceed with the liquidation. The circular gives the excess of assets over liabilities as £320,313.

**R. Waygood & Co.**—A dividend making 6 per cent. for the year is recommended, with £6,156 carried forward.

**J. G. White & Co.**—A profit of £70,387 is reported, a 12 per cent. dividend is recommended, and an extra 10s. per share on the ordinary shares, with £15,000 to reserve and £21,766 carried forward.

**Electric & General Investment Co., Ltd.**—A gross profit of £15,281 is reported. A final dividend of 1s. per share, making 10 per cent. for the year, is recommended, after payment of debenture interest and preference dividends, with £3,285 carried to contingencies fund.

## NEW COMPANIES

**ELECTRIC FLOOR MACHINE CO.,** 86 Hatton Garden, E.C. Capital £3,000.

**BROUGH ELECTRIC LIGHTING CO.**—Capital £1,500. To carry on the business of an electric lighting company at Brough, Westmorland.

**G.M. WIRELESS PATENTS SYNDICATE,** 2 Coleman Street, E.C. Capital £3,000. To acquire patents relating to wireless telegraphy and telephony.

**ELECTRICAL FINANCE & SECURITIES CO.,** 3 Laurence Pountney Hill, E.C. Capital, £50,000. To invest in the securities of electrical, engineering, telephonic and telegraphic appliance, tramway, railway, power, light, and similar companies, &c. The signatories are G. H. Nisbett, J. Taylor, D. Sinclair, E. K. Muspratt, J.P., J. S. Harmood-Banner, D. Bates, and W. B. Cowrie.

**BRITISH WILLARD BATTERY CO.,** 37 Bedford Row, W.C. Capital, £10,000. To adopt an agreement with the Willard Battery Co. of Cleveland, U.S.A.

**ELECTRO-STEEL FOUNDRIES,** registered by Tunbridge & Co., 17 Waterloo Street, Birmingham. Capital £45,000. Private company.

**UNITED STATES RAILLESS ELECTRIC TRACTION.**—Registered by Jordan & Sons, Chancery Lane. Capital, £1,000. Private company.

**HEMMING CONDUIT GRIP.**—Lincoln's Inn Chambers, Corporation Street, Birmingham. Capital, £2,000. Directors, A. E. Beck and J. R. A. Hemming.

**Gas Co. and Electric Hiring at Ilford.**—An interesting action is pending between the Ilford Gas Co. and the Ilford U.D.C. The allegation is that the Council's Electricity Department is spending money illegally in electrical fittings, and also that preferential rates are being given in the matter of power charges. The matter was before the Chancery Courts last week when, on behalf of the Corporation, it was agreed not to enter into any more sales with regard to fittings, pending the hearing of the action. It was also intimated that the case might go to the Court of Appeal.

**Death in an Electric Bath.**—At an inquest recently at Hellingly Asylum on the death of a patient while under treatment in an electric bath, it was found that the death was due to heart failure, and no blame attached as to the management of the bath.

**Wiremen's Wages in Liverpool.**—With reference to the agitation for increased wages to wiremen in Liverpool mentioned in ELECTRICAL ENGINEERING, May 21st, page 278, it is now announced that the wages of all union wiremen have been reduced from 9½d. to 9d. per hour from last Saturday. A rate of 1s. per hour had been asked for. The Liverpool masters did not see their way to granting a higher rate than in force in Manchester. It is reported that 400 men are out on strike.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 392 [VOL. X., No. 27]

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THURSDAY, JULY 2, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price **1d.**

### SUBSCRIPTION RATES.

United Kingdom. **6s. 6d.** per Annum.

Canada. **8s. 8d.** per Annum.

Other Colonies and Abroad. **13s.** per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 3509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

A NEW power station of an ultimate capacity of 140,000 kw. generating at 20,000 or 30,000 volts is projected at Glasgow. (Page 380.)

THE Helsby Wireless Telegraph Co. is being sued by Marconi's Wireless Telegraph Co. in respect of an alleged infringement of Patent No. 7,777/00. An account of the proceedings is given. (Page 381.)

THE North Metropolitan Electric Power Co. has been authorised by a House of Commons Committee to take a supply of electrical energy in bulk from the Metropolitan and London and North Western Railway Companies. (Page 381.)

THE Blackhall Colliery of the Horden Collieries, which is described in a Paper by Messrs. J. J. Prest and J. Leggat, is worked entirely by electric power. (Page 382.)

A PAPER by J. Davidson before the Institution of Mining Engineers dealt with the employment of gas engines in colliery generating plant. (Page 382.)

AN electrically-worked furnace pusher in a South Wales steel works is illustrated. (Page 383.)

AN explosion-proof circuit-breaker and the use of lifting magnets in steel works are referred to. (Page 384.)

A METHOD of manufacturing a steel with very low hysteresis factor, communicated to the B.T.-H. Co. by the G.E. Co. of America, is described amongst the mining and metallurgical patents. (Page 384.)

THE calculation of currents and resistances in branched circuits is dealt with in our Questions and Answers columns. (Page 385.)

AMONGST the specifications published last week was

one dealing with the manufacture of ductile tungsten and another relating to mercury rectifiers. Opposition has been entered to the grant of two patents. (Page 386.)

AN illustration is given of the ovens at the G.E.C. Carbon Works, Witton. (Page 387.)

IN his report upon the railway accident at Burntisland, on the North British Railway in April, Major Pringle calls attention to the fact that three of the coaches involved were lighted by gas and the remainder by electricity, and he attributes the origin of the fire to the gas.—Although the past year's working of the L.C.C. tramways show a deficit of £88,520, this result is arrived at after the payment of £328,109 interest and £108,488 repayment of capital. Steps are to be taken to improve the working of the tramways by further linking up and doing away with dead ends. (Page 387.)

THE present position of the Imperial wireless scheme was outlined in the House of Commons last week.—Automatic telephone exchanges are to be tried in Norway at a cost of £55,000. (Page 387.)

ILLUSTRATED articles in our Trade Section deal with the lighting of the temporary Congress Hall of the Salvation Army, the indirect lighting of a bandstand, and electric fans. (Pages 388 and 389.)

NEW plant is required at Eastbourne, Colwyn Bay, Glasgow, Warrington, Marylebone, Truro, Walsall, Bombay, Aylesbury, and Blackrock.—An electric lighting scheme is under consideration at Crook, and the Willesden Guardians are considering putting down its own generating plant. (Page 391.)

INCREASES in the demand for current for heating and cooking are reported at Marylebone, Brighton, Hull, and Eastbourne. In the latter place, however, the Committee is urged to reduce the present charge of 1½d. per unit.—The Southport electrical contractors are dissatisfied with the decision of the Electricity Committee to open showrooms and hire out cookers and heating apparatus.—Fifty-one chimneys have been put out of use at Bury by firms who are taking electrical energy from the Corporation.—The Board of Trade has refused to grant the Ely Gas and Electricity Co. electric supply powers. (Page 392.)

THE possibility of reducing the fuel costs in power stations to 0·07d. per unit by the use of gas produced on the low temperature system of carbonisation was referred to at the annual meeting of Coalite.—The Trafford Power & Light Supply Co. anticipate receiving an offer for purchase in the near future now that the proposal of the Manchester Corporation has fallen through. (Page 392.)

**The Engineering and Machinery Exhibition, 1916.**—Arrangements are now very far advanced in connection with the Engineering and Machinery Exhibition which is to be held by the Machine Tool and Engineering Association at Olympia from September 28th to October 18th, 1916, and copies of the Rules and Regulations have now been issued, together with a plan and application forms for space and power supply.

## ARRANGEMENTS FOR THE WEEK

(TO-DAY) THURSDAY, JULY 2ND.

*Institution of Civil Engineers.*

8.30 to 11.30 p.m. Annual Conversazione.

WEDNESDAY, JULY 8TH.

*Diesel Engine Users' Association.*

4 p.m. Meeting at Institution of Electrical Engineers, Victoria Embankment.

### The London Electrical Engineers.

Henceforth, until a date in October to be announced later, Headquarters will remain closed for drill purposes.

Headquarters will be opened daily for transaction of regimental business from 10 a.m. till 4 p.m., except Saturdays, when the time will be from 10 a.m. till 12 noon. Headquarters will be closed for all purposes on August 3rd and 4th.

### THE NEW GLASGOW POWER STATION

MR. W. W. LACKIE (City Electrical Engineer, Glasgow) has now completed the plans for the new power station, which is to have an ultimate capacity of 140,000 kw., and is to supplement the stations at Port Dundas and Pollokshaws Road, which are now loaded practically at their full capacity. An interesting feature of the system is that current will be transmitted from the works at a pressure of at least 20,000 volts, and probably 30,000 volts, to five distributing centres, which will include the existing stations at Govan and Partick, taken over by the Glasgow Corporation when these two Burghs were embodied in the City. At present, at any rate, the plant at these two stations will be retained and run in parallel with the new station at peak.

The new station, which is situated at Dalmarnock Bridge, on the Dalmarnock Road, will occupy a site of 53,677 sq. yds. The first section of the station to be built will contain one unit of 15,000-kw. capacity, and two units of 10,000-kw. capacity each. In view of the size of these units the boilers will, of course, have to be built at right-angles to the engine-room, and the boiler-house will be in three floors, as suggested in Mr. Lackie's remarks at the I.M.E.A. meeting, published in our issue of last week. A steam pressure of 200 lb. per sq. in. will be employed, and the steam will be superheated to 650° F. Water will be obtained from the Clyde, and a special canal is to be cut for this purpose. It

is estimated that there will be no difficulty in obtaining 10 million gallons of water per hour, which will be required when the station is working at its full capacity. A railway siding will, of course, be built on the site for the coal supply, and special arrangements are being made to enable a stock of from 60,000 to 70,000 tons being maintained if necessary.

It is proposed to generate current at 6,500 volts, and to step up to the 20,000 or 30,000 transmission voltage. As stated by Mr. Lackie at the I.M.E.A., the cost of the works is estimated not to exceed more than £10 per kw. of plant-capacity, and this £10 includes not only the power-house equipment, but also buildings, &c., although not the land.

### Conversazione of the Institution of Electrical Engineers.—

The Annual Conversazione of the Institution of Electrical Engineers was held at the Natural History Museum, South Kensington, on Thursday last, when a large number of members and visitors were received by Mr. W. Duddell, F.R.S. (President), and Mrs. John Smithers. Excellent programmes of music were performed by the String Band of the Royal Engineers in the main hall, and by the Royal Windsor Glee Singers in the Shell Gallery. Among those present were the following:—Sir F. A. Bosanquet, K.C.; Col. R. E. B. Crompton, C.B.; Sir William Crookes, P.R.S.; Sir J. M. Davidson; Mr. F. Gill; Mr. R. Hammond; Col. R. C. Hellard, C.B.; Col. Sir T. H. Holdich, K.C.M.G.; Prof. B. Hopkinson; Vice-Admiral Sir H. B. Jackson, K.C.B.; Prof. C. F. Jenkin; Dr. G. Kapp; Major J. N. C. Kennedy, R.E.; Mr. J. E. Kingsbury; Major-Gen. Beresford Lovett, C.B.; Prof. E. W. Marchant; Lt.-Col. The Hon. Sir N. J. Moore, K.C.M.G.; Mr. W. M. Mordey; Sir Henry Norman, M.P.; Dr. F. G. Ogilvie, C.B.; Major W. A. J. O'Meara, C.M.G.; Baron de Ropp; Mr. P. F. Rowell (Secretary); Major-Gen. R. M. Ruck, C.B.; Dr. A. Russell; Mr. A. H. Seabrook; Mr. Roger T. Smith; Mr. John Smithers; Sir John Snell; Prof. S. P. Thompson, F.R.S.; Prof. R. M. Walmsley; and Mr. W. B. Woodhouse.

### The Council of the Institution of Electrical Engineers.—

Mr. H. C. Levis (Managing Director, British Thomson-Houston Co., Ltd.) has been elected Associate member of the Council, to fill the vacancy caused by the death of Mr. A. Bruce Anderson.



THE HOT WEATHER.

A Suggestion for Seaside Electricity Works. A Daylight Summer Load with High Diversity Factor.

## MARCONI WIRELESS TELEGRAPH PATENT CASE

ON Wednesday last a case of considerable interest was opened before Mr. Justice Eve in the Chancery Division of the High Court of Justice. The plaintiffs were G. Marconi and Marconi's Wireless Telegraph Co., who sued the Helsby Wireless Telegraph Co. to obtain damages in respect of an alleged infringement of Marconi's Patent No. 7,777 of 1900 (now expired) by wireless apparatus which had been fitted on four ships, viz., *Anglia*, *Cambria*, *Scotia*, and *Umbria*, for the London & North Western Railway. Professor B. Hopkinson acted as assessor. Mr. A. J. Walter, K.C., and Mr. Hunter Gray (instructed by Messrs. Coward, Hawksley, Sons & Chance) appeared for the plaintiffs. Mr. Courtney Terrell and Mr. Arthur Jaffé (instructed by Messrs. Kenneth Brown, Baker, Baker & Co.) appeared for the defendants. The hearing of the case has been continued daily, with the exception of Saturday, and had not yet concluded yesterday.

The defendants denied infringement, and also claimed that the Patent 7,777/00 was invalid. Mr. A. J. Walter opened the case for the plaintiffs, and mentioned that, previous to 1900, investigators had found that a circuit which was a good conservator of electric energy was not well adapted for radiating electric waves, and *vice versa*. This difficulty was surmounted by Marconi's Patent of 1900, in which the transmitting apparatus consisted of two separate circuits tuned together. One circuit had a large capacity, and was therefore a good conservator of energy, and the other circuit, containing the aerial, was a good radiator. The two circuits were coupled through a transformer having a large leakage factor, i.e., "loosely" coupled. A similar pair of loosely coupled circuits were used at the receiving station. Fig. 1 shows the arrangement of the transmitting circuits.

Mr. Hunter Gray conducted the examination of the chief witness for the Marconi Co., Mr. J. Swinburne, who had examined the apparatus in use on the *Cambria*, and was of

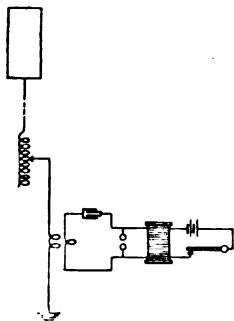


FIG. 1.

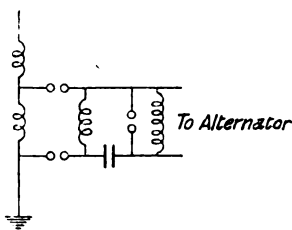


FIG. 2.

opinion that it worked in accordance with Marconi's Patent. Mr. Courtney Terrell, in cross-examination of the witness, elicited the statement that in Marconi's apparatus, long trains of waves are supplied to the aerial, by the conserving circuit at the same rate as they are radiated. He then quoted some replies given by the witness in a previous case, to the effect that in Sir Oliver Lodge's Patent No. 11,575 of 1897, energy was poured into a good oscillator from a good conservator. Mr. Swinburne stated that Lodge's theory was that his aerial was charged by an "impulsive rush" of energy, whereas Marconi used long trains of waves. Resonance curves, constructed by Dr. Erskine Murray from the particulars given in 7,777 of 1900, were exhibited. These were seen to be double humped, thus showing interference between the primary and secondary circuits. A resonance curve from the *Scotia* was shown, and was seen to be a pure wave. This was said to be due to the fact that the sparks used were rapidly extinguished by the use of a charging coil, and two extra spark-gaps. Fig. 2 shows diagrammatically the arrangement of the circuits in the alleged infringing installations. Documents by Tesla, M. Ducretet, and Mr. Blondlot were cited as anticipatory to Marconi's invention.

Mr. Walter in re-examining Mr. Swinburne, quoted from a previous judgment by Mr. Justice Parker, a statement that Sir Oliver Lodge used two circuits for transmitting, so that the radiating circuit could be cut off from the supply circuit immediately after charging, not so that one acted as a reservoir for the other. The defendants' apparatus differed from Lodge's in having an extra inductance in the circuit, thus preventing the impulsive action desired by Lodge. Tuning was admitted to be well known before 1900 but it had not been suggested to use tuning and loose coupling for wireless

signalling. The second witness for the plaintiffs was Mr. Pletts, who in examination by Mr. Gray stated that in his opinion the calculations of Dr. Erskine Murray for the resonance curves previously shown, were incorrect owing to a wrong method having been used. The witness, in cross-examination by Mr. Terrell, admitted that Marconi's apparatus would give a "double humped" resonance curve. Re-examined by Mr. Gray, he said that he did not think that the small gaps and the charging coil, in the alleged infringing apparatus, were sufficient to quench the spark properly. Consequently he did not understand how the *Scotia* resonance curve was only single humped.

The next witness was Mr. Dugald Clerk, who was examined by Mr. Gray, and stated that he had examined the defendants' apparatus and found that they employed an autotransformer, and that the system was essentially similar to that used on the *Nonsuch*, and found to be an infringement (see ELECTRICAL ENGINEERING, December 15, 1910, p. 791), except that there were four spark-gaps instead of one, and that the transformer ratio was different. In cross-examination by Mr. Terrell, he admitted that a combination of an "Oudin" resonator with M. Ducretet's apparatus might have been successfully used as a Marconi transmitter. Mr. Walter, in re-examining witness, obtained a statement that M. Ducretet did not know how to utilise his apparatus for this purpose until Marconi's invention.

Mr. Terrell, in his opening speech for the defendants, said that the essential feature of Marconi's 1900 Patent was a persistently oscillating circuit, supplying energy to a good radiating circuit, i.e., the aerial circuit. The defendants' apparatus did not include a persistently oscillating circuit owing to the two small charging gaps which quenched the main spark very rapidly. With reference to the plea of invalidity he cited the writings of Tesla in 1898 and M. Ducretet, as containing the essential features of Marconi's Patent.

Dr. Erskine Murray, who was then examined by Mr. Jaffé for the defendants, contradicted statements by the previous witnesses that the small charging gaps and charging coil in the defendants' apparatus were inadequate to quench the main spark. In view of these conflicting opinions, the court took the opportunity on Tuesday of inspecting apparatus made by defendants to correspond with the *Scotia* installation. The main spark was viewed in a rotating mirror first with the charging gaps and coil in circuit, then with the gaps short-circuited and the coil cut out. A difference was observed between the two sparks.

The examination was continued yesterday, when witness exhibited a photograph of sparks from this apparatus. The cross-examination of Dr. Murray by Mr. Walter was proceeding on our going to press.

## A LONDON "BULK" SUPPLY AGREEMENT

THE Bill of the North Metropolitan Electric Power Co. which authorises the Power Co. to take a supply of electrical energy in bulk from the Metropolitan and London & North Western Railway Cos. was passed by a House of Commons Committee last week. There was considerable opposition on the part of the London County Council and the London supply companies on the ground that the proposed arrangement would tend to complicate the issue when the County Council came to purchase the London undertakings. It was pointed out to the Committee that the North Metropolitan Power Co. has authority to supply in one or two districts in the County of London by the permission of the local authorities, and that it is now actually supplying in Stoke Newington, and also to two small lengths of tramways. Eventually the Committee passed the Bill, with the proviso that any current taken from the two railway companies should not be used in the County of London other than in those districts where the Power Co. is at present giving a supply.

**Testimonial to Prof. John Perry.**—In view of the retirement of Prof. John Perry, F.R.S., from the staff of the Imperial College of Science and Technology, a fund is being raised to give expression to the appreciation of his services to Engineering Education. A part of the fund, which would be administered by the authorities of the Imperial College, would be devoted to a personal presentation, and a part to a prize to be awarded annually. A similar award may also be instituted at Finsbury. There must be many who wish to subscribe to the fund, including some outside the old students, who have already been appealed to. Subscriptions should be sent to the Hon. Treasurer, Mr. P. T. Wrigley, Royal College of Science, South Kensington, S.W.



## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Published on the First Thursday of each month

### ELECTRICAL EQUIPMENT OF THE BLACKHALL COLLIERY

A PAPER by Messrs. J. J. Prest and J. Leggat, read at the London meeting of the Institution of Mining Engineers, described the sinking and equipment of the Blackhall Colliery, of the Horden Collieries, Ltd. Current for driving the electrical plant at this colliery is supplied by the Cleveland and Durham Electric Power Co., who already supply the Horden and Shotton Pits belonging to the same owners. At both of these, exhaust steam turbines are run in parallel with the power company's system. Electric driving, however, is used throughout the new Blackhall pit, and the plant includes two main electric winding engines, electrically-driven fans and air-compressors, motor-generators for the lighting circuits, electrically-driven underground pumps and haulages and surface machinery. The supply is at 2,900 volts three-phase 40 cycles, on which pressure all motors over 50 h.p. are run, and duplicate incoming feeders are provided. The smaller motors are run at 440 volts from two 200-k.v.a. Siemens transformers. All these are on the surface, for there is no motor of less than 100 h.p. underground.

The main winding engines were supplied by the British Westinghouse Co. They are both alike, and are designed to raise 189 tons per hour from 450 yards depth. Each cylindro-conical drum is given through 545 to 1 double helical Citroen gearing from a 700 to 1,500 h.p. induction motor running at a maximum speed of 230 r.p.m. No form of power storage is used, as the supply company are quite prepared to deal with the peaks of the load. These are believed to be the largest geared winding engines in the country. The gear runs in oil in oiltight cases. A very complete equipment of emerging and working brakes is provided fully interlocked with the control system, and worked from a motor-driven air compressor or alternately by the main compressed-air system as a stand-by. The controllers are of the liquid type, with fixed contact plates, and are worked by the electrolyte being pumped from one tank into another. The reversing switches, which are worked by the same lever that controls the liquid rotor resistance tanks, are oil-immersed with auxiliary sparking contacts.

The main switchgear is in two boards, each of the "ward-robe" type with steel cells. The bus-bars are sectionalised, and there are fifteen panels in all. The low-tension board is protected by Merz-Price gear, so that it is disconnected on any failure on the high-tension side. The two main air compressors are by Belliss & Morecom, and are direct driven by Westinghouse 535-b.h.p. motors running at 233 r.p.m. Each has a capacity of 3,000 cu. ft. of free air per minute compressed to 80 lb. per sq. in. There are two main ventilating Walker fans, one for 25,000 cu. ft. per min. at 4 in. water gauge, and the other 400,000 cu. ft. per min. at 8 in. water gauge. They are driven through ropes, and at their full speeds of 185 and 215 r.p.m. will require 300 and 800 h.p. respectively.

During the development of the colliery the fans will be run at varying speeds by changing the rope-pulleys. At the present time the small fan is operated by a motor of 100 brake horse-power, and the large fans by a 300 brake horse-power motor. Later on the 300 brake horse-power motor will be used for the small fan, and a bigger motor of 800 brake horse-power will be installed to drive the large fan, the 100 brake horse-power motor being then used for haulage purposes underground.

Two 60-kw. motor-generators, giving 220 volts D.C., are provided for both underground and surface lighting, including house and street lighting in the village. Each row of houses is provided with a pair of service-cables, running its full length in the false roof, to which cables the individual houses are connected. The ends of the service cables are brought out at the ends of the rows, and are then connected to the main bare stranded-copper distributors, which connect the rows together. No meters are installed in the houses, but each consumer pays a weekly amount according to the number of lamps installed.

The permanent underground pumping plant will consist of three high-lift Sulzer horizontal shaft turbine pumps each capable of pumping 1,500 gallons per minute against a head of 1,020 ft., direct driven at 1,170 r.p.m. of Westinghouse induction motors. The guaranteed over-all efficiency of these sets is 71.6 per cent. The underground haulages will be each driven by 100-h.p. 2,800-volt slip-ring motors with liquid starters, but these are not yet installed. Paper-insulated lead-covered cables are used throughout with the exception of the surface-lighting cables, which are carried overhead, and the power cables in-bye, which are paper-insulated, bitumen-sheathed, and double-wire armoured. The cables feeding the winding engines, workshops, and screens, and the portion of the shaft cables that runs between the switch-board and the shaft, are single-wire armoured, while the shaft cables themselves are double-wire armoured. All the cables on the surface are laid in sand, in specially built brick trenches. At the shaft-head the trench in which the shaft-cables are laid is enlarged into a chamber, in which a joint-box connects the surface portions of the cables to the shaft cables proper.

### GAS ENGINES FOR COLLIERY WORK

IN a Paper read at last month's London meeting of the Institution of Mining Engineers, Mr. J. Davidson dealt with the use of the internal combustion engine for power generation at collieries. Up till lately, he said, too little attention had been paid to the cost of power generation at collieries, but now there was a growing tendency to economise by using exhaust steam turbines. He dismissed this, however, as a makeshift, and insisted that the most economical prime mover of the present day was the internal combustion engine. The gas engine was admirably suited for colliery work. In cases where inferior coal is available it can be used most economically with gas-producers of the recovery type; and where the total power required is considerable, the return for the bye-products reduces the cost of gas to a negligible quantity. Where bye-product coke-ovens are in use, the surplus gas can be used to the greatest advantage in the gas engine; and, of course, for ironworks the most economical use for the blast-furnace gas is this form of prime mover.

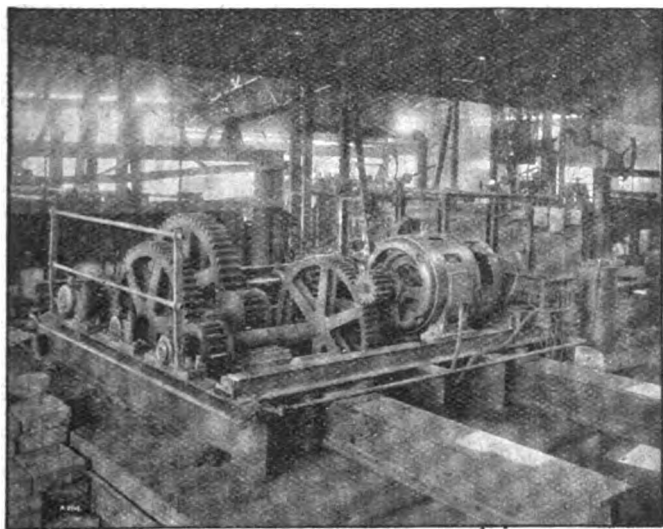
Some comparative estimates were gone into for a 2,000-h.p. plant running 7,200 hours per annum, and the following costs per unit generated were arrived at. Steam turbine plant with coal-fired boiler, 0.238d.; steam plant with boilers fired by recovery producer gas, 0.244d.; gas engines with recovery producers, 0.141d., coke-oven gas fire boiler with steam turbines, 0.193d.; and coke-oven gas in gas engines, 0.126d. A further possibility in economy lay in the use of boilers heated by the exhaust from the gas engines, which could evaporate from 2½ to 2½ lb. of water per B.H.P.-hour.

Accumulated experience had now removed the reproach of unreliability from the gas engine. With the different kinds of gas it was now realised what cylinder compressions were safe from risk of pre-ignition. Statistics of break-downs showed that the gas engine now compared most favourably with the steam turbine. Going into engine details, the author expressed a preference for the vertical type of fairly high speed, which could be directly coupled to electric generators. There had been, however, a tendency to multiply the number of cylinders unduly, which was mainly due to a desire to avoid water-cooling of the pistons, although this was now quite practicable. He thought that the cross-head style of engine would supersede the single-acting trunk engine, and gave a description of the "Duplex" double-acting two-cycle engine now being built by Mather & Platt.

**A Possible Cause of Colliery Explosions.**—In the course of a speech at the annual dinner of the Institution of Mining Engineers, Prof. H. Louis referred to a Paper read recently by Mr. Rudge, in which he asserted that coal dust, carried along by a current of air, could become electrified, and was capable of charging insulated conductors to a high potential. He suggested that this might have been the cause of some hitherto unexplained explosions.

## ELECTRICAL PLANT IN A SOUTH WALES STEEL WORKS

ONE of the oldest firms in South Wales engaged in the steel and tin-plate trade recently brought its plant up to date by adopting electric drive for a considerable portion of the works. The power house contains two 230-kw. 500-volt 50-cycle steam-driven "Witton" three-phase alternators running at 428 r.p.m. These have direct-coupled exciters, which are also utilised for lighting. An interesting application of electric power in this works is the driving of the furnace pushers, illustrated here. They are driven by 50-h.p. "Witton" reversible intermittently rated motors geared to the pushers by spur-wheels and rack. One pusher serves for operating two rows of ingots. These it moves alternately. The cold ingots are placed in front of the pusher, which is advanced as soon as the furnace-door is opened, and the



ELECTRICALLY-DRIVEN FURNACE PUSHER.

ingots are forced by successive operations through the furnace. A large roll-turning lathe is driven by a direct-coupled 50-h.p. motor through worm gearing. It gives a turning speed on the lathe of 1.5 to 2 r.p.m. by means of a speed controller in the rotor circuit. The charging boxes for the steel furnaces are loaded by means of "Witton"-Kramer magnets. As the power generated is alternating current, the magnets, which are of 42 inches diameter, are supplied through motor-generators.

The magnets are suspended from a travelling crane. Within six months of the installation of the first magnet it was realised that very great economies were being effected, and a repeat order was placed for a similar equipment. The electrical equipment for this installation was supplied by the General Electric Co., Ltd. (Witton, Birmingham, and 67 Queen Victoria Street, E.C.).

**Electric Lamps for Mines.**—In the course of a Paper by Mr. A. D. Mitton read recently before the Manchester Geological and Mining Society, the author said that many mines were using electric lamps entirely, except for examination of the mine for gas. In a recent case where only electric lamps were used a man was overcome by gas, and died before its presence had been detected. The management at once ordered that in every working-place where electric lamps were used there must always be a spare flame lamp; but a few days afterwards a heavy blower of gas came out suddenly whilst work was in progress; the gas immediately extinguished the flame lamp, and the men just managed to escape with their lives by the light of the electric lamps.

**Ignition of Gas by Sparks.**—Referring to Prof. W. M. Thornton's experiments on the limiting voltages and currents below which the ignition of gaseous mixtures cannot be effected, Dr. J. Mennier writes to the *Colliery Guardian* stating that, according to researches by himself and Prof. Couriot, the size of the wires has considerable influence on the igniting power of the spark, fine wires enabling ignition to be effected with smaller currents. With silver wires 0.1 mm. diameter they ignited a mixture containing 9.5 per cent. of methane with an almost invisible spark.

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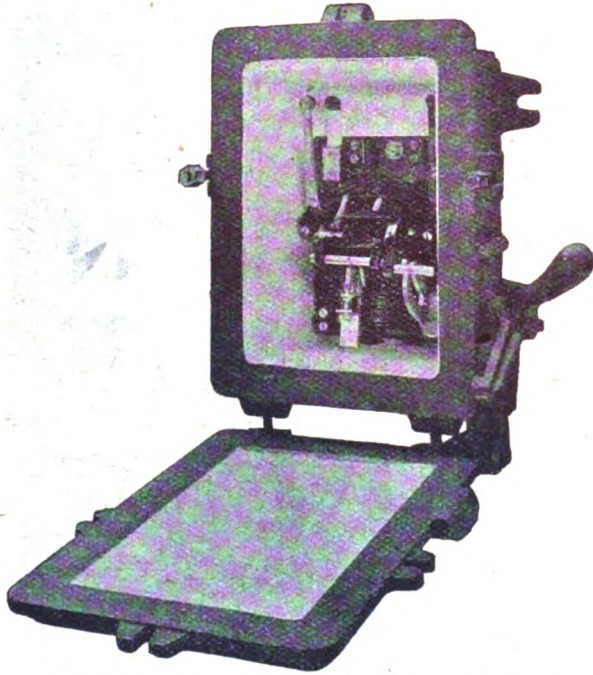
PINCHIN, JOHNSON & Co., LTD.  
Minerva House, Bevis Marks, LONDON, E.C.





### AN EXPLOSION-PROOF CIRCUIT-BREAKER.

TO meet the demand for a small explosion-proof circuit-breaker for mining work the General Electric Co., Ltd. (Witton, Birmingham, and 67 Queen Victoria Street, E.C.), have placed on the market the small breaker illustrated here. Its capacity is 30 amperes at 300 volts, or 15 amperes at 500 volts. It is of the double-pole type with overload trip. The case is explosion-proof, with wide and well-machined flanges, which are in no case cut away to take the holding-down bolts. A flame-proof gland is provided where the switch spindle passes through the case. Internally the device has



30-AMPERE FLAME-PROOF G.E.C. CIRCUIT-BREAKER.

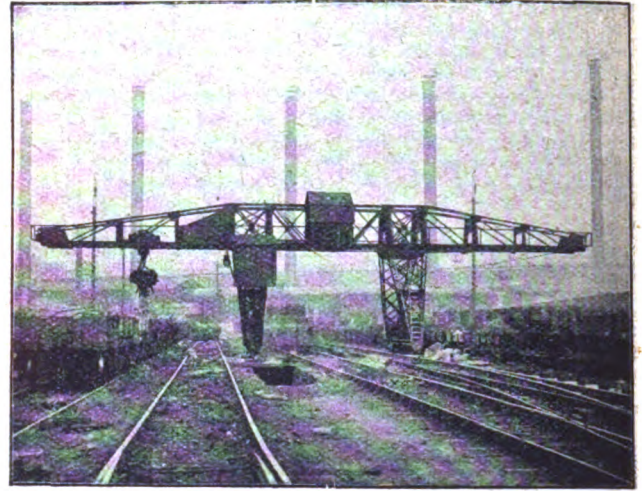
been designed with ample clearance and with ample insulation. The G.E.C. standard patent interlock is embodied so that the breaker cannot be closed until the lid is first closed, nor can the lid be opened until the breaker is in the "off" position. This interlock has been specially designed for colliery work, for which interlocking gear of a delicate nature is entirely unsuitable. The overload trip is easily adjustable over a wide range. The breaker has been designed to take the G.E.C. standard mining glands, which complete the flame-proof characteristics of the case.

**The Association of Consulting Engineers.**—At the annual meeting on May 25th, the annual report and accounts were adopted on the motion of the chairman, Mr. G. Midgley Taylor, and the following were elected to fill vacancies on the committee:—Town members: H. W. Handcock, H. J. Rofo, A. M. Sillar, and M. G. Weekes; country members, J. H. Blizard and T. H. Yabbicom. The report gives the number of members as seventy. The Association has now been incorporated under the Companies Act. The necessary alterations to the articles have been made to admit membership of the Institution of Civil Engineers of Ireland as a qualification. The Association has been in communication with local authorities with a view to discouraging advertising for consulting engineers, and in relation to the offer of the electrical department of a certain borough to act as consulting engineers to mill and factory owners at a fee. The Committee of the Association announce that it is willing to undertake the appointment of umpires in engineering contracts.

**The Batti-Wallahs.**—The summer outing of the Batti-Wallahs, which took the form of an up-river trip on Saturday last, was a great success. About 90 members with ladies and friends participated, and the start was made on the launch *Royal Thames* at 2 o'clock from Kingston. The party proceeded up river to Weybridge, where a meal was provided, and returned to Kingston about 9 o'clock. Among those present may be mentioned the President, Mr. Avila, Mr. and Mrs. Snow Huddleston, Mr. and Mrs. F. Pooley (Hon. Sec.), Mr. and Mrs. Ashley Pope, Mr. and Mrs. Prangnell, Mr. and Mrs. Barfield, Mr. and Mrs. Wyld, Mr. Lange, Mr. and Mrs. Newton Russell, Mr. R. W. Hughman, Mr. and Mrs. Fisher, Mr. and Mrs. Sharp, Mr. and Mrs. Donison, and Mr. Ralph Ball. Mr. D'Arcy, of the B.T.-H. Co., contributed to the impromptu concert on board at the piano. A special number of the *Batti-Wallah's Journal* was published for the trip.

### LIFTING MAGNET TRANSPORTER EQUIPMENT

IN order to overcome the delays due to the trucks bringing the charging material for loading the charging boxes in steelworks, passing along one or two lines only, a wide span transporter crane is now often used. The accompanying illustration shows a good example. The Witton-Kramer magnet equipment shown is particularly effective, and accom-



TRANSPORTER EQUIPPED WITH LIFTING MAGNETS LOADING CHARGING BOXES FROM RAILWAY TRUCKS IN A STEEL WORKS.

plishes the unloading of trucks from any of the sets of rails. It was found that at the ordinary rate of working 58 tons of material could be fed into the charging boxes in 57 minutes—a remarkably good performance. The magnet is of 52-in. diameter, and was constructed by the Witton-Kramer Electric Tool & Hoist Co., Witton, for whom the General Electric Co., Ltd., of 67 Queen Victoria Street, E.C., are the sole selling agents.

### MINING AND METALLURGICAL PATENTS FOR JUNE

#### Mining.

IN specification 26,802, of 1913, J. Kraus describes an improved type of electrostatic separator in which the electrodes are made of a partially conducting material, such as wood, marble, or paper. The material to be separated is allowed to fall vertically between two or more charged electrodes, and any attracted material is conveyed away by endless conveyor bands, which pass over the surface of the electrodes. The chief advantage is that sparking between the electrodes is prevented.

#### Metallurgical.

The following specifications, which have been published during June, will be of interest to metallurgists:—No. 11,370, of 1913, communicated to the B.T.-H. Co. by the G.E. Co. of America, describes a method of manufacturing steel having a very low hysteresis loss by annealing silicon steel in an electric annealing oven. The process must be carried out under vacuum. A method of improving the purity of the metallic products of electrolysis by arranging a porous diaphragm between the two electrodes, so as to prevent the passage of impurities, forms the subject of specification No. 11,364, of 1913, by E. J. Hunt, of Oldbury. Another communication from the G.E. Co. of America to the B.T.-H. Co., describing a method of producing boron suboxide by heating a borate in contact with silicon in an electric furnace, is found in specification No. 15,757, of 1913. The improved manufacture of electrolytic iron by first oxidising the electrolyte by stirring in contact with air, and then using a rotating cathode, and increasing the temperature of the electrolyte during electrolysis, forms subject-matter for specification No. 16,565, of 1913, by Société Anon. "Le Fer," of Isère (France). W. N. Crafts, of Ohio, in his specification No. 18,073, of 1913, gives particulars of an induction shaft-furnace, in which the secondary circuit is formed entirely of metal instead of a mixture of slag and metal, as in previous types. He also shows an arrangement for allowing the molten metal to be tapped off without interfering with the electric continuity of the secondary circuit.



# QUESTIONS AND ANSWERS BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper, attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

## QUESTION No. 1,398.

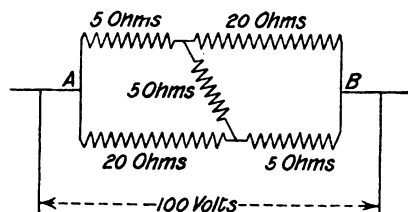
A three-phase slip-ring motor generator, 400 h.p. 2,200 volts, is loaded about 35 per cent., and is supplied from a distant power station  $2\frac{1}{2}$  miles away, through aluminium lines 37/12 S.W.G. The motor runs satisfactorily until another motor of 300 h.p. is switched in circuit, when a heavy thump is heard shaking the foundation and breaking the bridge connections of rotor winding each time the second motor is switched in; this machine is controlled with reversing switch, and is 500 yds. further away. The thump is not heard in the motor when switching on the motor-generator. The starting current of the motor is about 50 amps. at 2,200 volts.

Can I do anything to prevent this heavy thump?—DEAD EARTH.

(Replies must be received not later than first post, July 9th.)

## ANSWERS TO No. 1,398.

The diagram represents a set of resistances connected up as a Wheatstone's bridge. Show how to calculate the combined



resistance between A and B, and the current that will flow through each arm of the circuit if a potential difference of 100 volts is applied between these points. "C. M. Y."

The first award (10s.) is given to "P. H. S." for the following reply:—

Let C and D (in Fig. 1) be the voltage at the points indicated, and let a, b, c, d, and e be the currents in the branches indicated.

By Kirchoff's law the algebraic sum of the currents at any

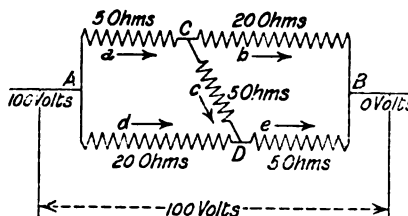


FIG. 1.

point is zero. Therefore currents at points C and D in the figure are zero, and the following simultaneous equation is obtained:—

$$\frac{100 - C}{5} - \frac{C}{20} - \frac{C - D}{5} = 0 \quad \therefore -9c + 4d = -400$$

and

$$\frac{100 - D}{20} + \frac{C - D}{5} - \frac{D}{5} = 0 \quad \therefore 4c - 9d = -100.$$

From this we get the values  $C = 61.54$  volts and  $D = 38.46$  volts.

$$\therefore \text{Current in } a = \frac{100 - C}{5} = \frac{100 - 61.54}{5} = 7.69 \text{ amps.}$$

$$b = \frac{C}{20} = \frac{61.54}{20} = 3.08 \text{ ,,}$$

$$c = \frac{C - D}{5} = \frac{61.54 - 38.46}{5} = 4.61 \text{ ,,}$$

$$d = \frac{100 - D}{20} = \frac{100 - 38.46}{20} = 3.08 \text{ ,,}$$

$$e = \frac{D}{5} = \frac{38.46}{5} = 7.69 \text{ ,,}$$

Total current flowing =  $a + d$  or  $b + e = 7.69 + 3.08 = 10.77$  amps.

$$\therefore \text{Combined Resistance} = \frac{E}{C} = \frac{100}{10.77} = 9.3 \text{ ohms.}$$

The second award (5s.) is made to "E. H.," who writes as follows:—

The simplest way to work out this problem is, first of all, to calculate the currents in each circuit, and then, from the total current, to determine the combined resistance of the arrangement.

Let  $I_1$ ,  $I_2$ , and  $I_3$  (Fig. 2) be respectively the currents in AC, AD, and DC, and that the directions of these currents be as indicated in the figure. Since the resistances are arranged:

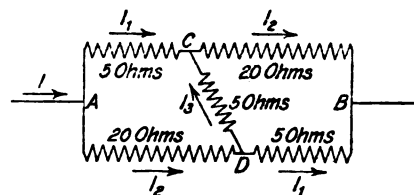


FIG. 2.

symmetrically,  $I_1$  and  $I_2$  will also be the currents in DB and CB respectively. The pressure across AB is given as 100 volts. Now, it is quite immaterial which circuit between A and B we consider; the algebraic sum of the voltages between those two points must in each case be 100 volts. Thus, taking circuit ACB, we have

$$5I_1 + 20I_2 = 100, \quad \therefore I_1 + 4I_2 = 20 \quad (1)$$

Circuit ADB gives the same equation.

Again, taking circuit ACDB,

$$5I_1 - 5I_3 + 5I_1 = 100, \quad \therefore 2I_1 - I_3 = 20 \quad (2)$$

The reason for the -- sign is that the current  $I_3$  is being assumed to flow from D to C.

Also, from circuit ADCB, we have

$$20I_2 + 5I_1 + 20I_2 = 100, \quad \therefore 8I_2 + I_1 = 20 \quad (3)$$

Subtracting (2) from (3) gives

$$4I_2 - I_1 + I_3 = 0, \quad \therefore I_3 = I_1 - 4I_2 \quad (4)$$

If we consider the currents at, say, C, the sum of the currents flowing towards that point is equal to the sum flowing away from it.

$$\therefore I_1 + I_3 = I_2, \quad \therefore I_1 = I_2 - I_3 \quad (5)$$

From equations (4) and (5)

$$I_1 - 4I_2 = I_2 - I_1, \quad \therefore I_1 = \frac{5}{2}I_2$$

Substituting for  $I_1$  in equation (1), we have

$$I_2 = 20 \times \frac{2}{13} = 3.08 \text{ amperes}$$

$$\therefore I_1 = \frac{5}{2} \times 3.08 = 7.7 \text{ amperes.}$$

and  $I_3 = 3.08 - 7.7 = -4.62$  amperes.

i.e.,  $I_3$  actually flows from C to D, and equals 4.62 amperes.

(Value of  $I_3$  has been purposely arranged to be negative, to show that it is immaterial, in the above calculation, in which direction we assume it to flow, so long as equations (2) and (5) are written with the corresponding signs.)

Total current flowing in at A =  $I_1 + I_2$ , = 10.78 amperes.

Combined resistance of the whole arrangement

$$= \frac{\text{Volts across AB}}{\text{Total Current}} = \frac{100}{10.78} = 9.28 \text{ ohms.}$$



## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published June 25th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad

12,421/13. **Manufacture of Tungsten.** C. GLADITZ. A method of obtaining tungsten in a form which is ductile and which has a comparatively high tensile strength. The finest form of tungsten-powder known, i.e., the "fluffy" form, is mixed with a certain percentage of a coarser-grained powder, compressed in a mould, and then gradually sintered in an atmosphere of inert gas. Precise information is given as to the method of making the coarser-grained powder from the fluffy form, as to the proportions of the two powders, and as to the exact way of carrying out the sintering process.

15,392/13. **Improved Mercury Rectifiers.** B.T.-H. Co. (*G.E. Co., U.S.A.*). The object of this invention is to prevent "reverse arcing" between the electrodes which normally act as the anodes. The anodes, which may be of any suitable metal such as iron or tungsten, are made hollow and filled with mercury, which is kept heated at its boiling point by independent heating coils immersed in the mercury. As the mercury is vaporised, it passes into a condensing chamber, and thence returns to the hollow interior of the anode. A method of sealing the anodes where they enter the rectifying chambers, so as to allow for adaption to changes of temperature without allowing any air to enter the evacuated interior of the rectifier is also contained in the specification. Four figures.

25,643/13. **Telephone Receiving Apparatus.** WESTERN ELECT. Co. (*R. Woodward*). An improved type of loud-speaking receiver, consisting of a metal casing which contains a double horseshoe magnet built up of four arms joined to a common yoke, a smaller electromagnet situated between the two poles of the composite magnet, and a sound-box containing a diaphragm to the centre of which is attached one end of a lever which is rigidly fixed to a flat armature situated near the poles of the above electromagnet. A set-screw is provided for varying the strength of the magnetic field by altering the air-gap between the electromagnet and its armature. It is claimed that its operation is very efficient. Five figures.

8,719/14. **Heating and Cooking Utensils.** R. SPRENGER. The invention relates chiefly to the hot-plate type of heaters. Hitherto, these plates have had to be made with comparatively thick walls in order to obtain a good accumulation of heat and to prevent the burning through of the heating elements which would occur if the tops of the plates were thin. Consequently the thermal efficiency of the plates has been small. By mounting the plate on a vertical spindle in the cooking range and arranging a powerful spring underneath, so as to force the plate up against the bottom of any utensil which may be required to be heated, it is possible to make the wall of the plate the desired thinness. Projections must be provided on the range and the utensils so that the latter remain in position. The connections are arranged so that the current cannot be switched on until the utensil is in position on the plate. Six figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** MARKS (*Siemens Schuckertwerke Ges.*) [Search-lights] 21,833/13.

**Dynamos, Motors and Transformers:** SOC. SCHNEIDER ET CIE. [Rotary transformers] 21,309/13; LANE [Dynamos] 253/14.

**Electrometallurgy and Electrochemistry:** MOSCICKI [Furnace for gas treatment] 13,250/13; WATIMANN AND TUDOR ACCUMULATOR Co. [Railway rail-joints] 14,519/13; COWPER-COLES [Deposition of copper on iron] 25,393/13.

**Heating and Cooking:** WEAVING and FERRANTI, LTD. [Water heaters] 9,930/13; MORDREY [Resistances] 15,764/13.

**Ignition:** UNTERBERG and HELMLE [Magneto apparatus] 13,006/13; TRIER [Engine starters] 16,965/13; TWIDDY & STALLY [Magnetos] 1,421/14.

**Instruments and Meters:** LEEDS [Resistance meter] 25,716/13; FARIES [Testing instruments] 26,997/13.

**Storage Batteries:** ICONOMUS [Accumulators] 22,841/13.

**Switchgear, Fuses and Fittings:** ROTHMAN and FERRANTI, LTD. [Motor starters] 12,936/13; NAYLOR and NAYLORGRAPH, LTD. [Devices for series lighting] 13,558/13; PERRY [Automatic motor-switches] 14,994/13; BRIT. WEST. ELECT. & MFG. Co. (*West. Elect. & Mfg. Co., U.S.A.*) [Circuit-breaker] 4,663/14; R. BOSCH [Regulators] 8,916/14; TURNER [Switches] 10,041/14.

**Telephony and Telegraphy:** COLONNA [Printing telegraphs] 18,568/12; HAMMOND [Wireless control apparatus] 13,310/13; MARCONI'S WIRELESS TELEGRAPH Co. and FRANKLIN [Wireless receivers] 13,636/13; [Means for increasing A.C. frequency] 13,637/13; SIEMENS & HALSKE AKT.-GES. [Selectors] 13,748/13; [Automatic telephone call meter] 6,892/14; ZEI and NARDIN [Relays] 18,438/13; EASTERN TELEGRAPH Co. and FRASER [Telegraph receivers and relays] 19,121/13, [Automatic telegraph transmitter] 26,278/13; GRAHAM [Telephone system] 27,753/13, 310/14; SOLDATENCOW [Telegraph receiver] 27,859/13.

**Traction:** MOUYEN [Signalling system] 10,803/13; MURRAY [Train control] 13,242/13, 13,243/13; SIEMENS BROS. & Co. and BOOT [Railway signalling] 25,018/13.

**Miscellaneous:** LEACH [Fans] 22,235/13; NITSCH [Alarms] 2,493/14; GRAHAM and SANTAFLEBEN [Telephone systems] 8,906/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** LIBANO [Insulator for overhead conductors] 12,443/14.

**Dynamos, Motors, and Transformers:** AKT.-GES., BROWN, BOVERI ET CIE. [Starting transformers] 12,012/14; SIEMENS SCHUCKERTWERKE-GES. [Slip-rings] 12,814/14.

**Switchgear, Fuses and Fittings:** DELLA CERDA [Lamp switches] 10,733/14.

**Telephony and Telegraphy:** DE LANGE [Thermo telephones] 4,203/14; HULTMANN [Telephone exchanges] 13,362/14.

### Application for Amendment

20,222/09. **Glass Reflectors, &c.** OTS A. MYGATT. Holophane, Ltd., seek leave to amend this specification on the ground that the scope of the patent as granted is too wide.

### Opposition to Grant of Patents

29,059/13. **Sparkling Plug.** C. SPADR. Opposition has been entered to grant of the above patent.

3,162/13. **Manufacture of Tungsten.** WESTINGHOUSE METALLFABRIK G. UHLAMPENFABRIK GES. It has been decided to allow the grant of this patent.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

11,933/00. **Motor Control.** R. LUNDELL. A system of series-parallel control, chiefly applicable to motor-driven vehicles. The field windings of all the motors are connected in series, and a small motor generator is arranged to provide them with the necessary exciting current. The first three speeds are obtained by connecting all the motor armature in series and having different amounts of resistance in the generator field circuit of the exciter. The change from series to series-parallel, or parallel connections of the motor armatures, is effected without breaking the main field circuit so that sparking is partially avoided. The connections allow of regenerative braking being employed. A reversing switch for altering the main field connections is also included in the specification. One figure.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** E. S. ALI-COEN [Insulating compound] 5,279/08.

**Dynamos, Motors and Transformers:** G. W. MASCORD [Motors and controlling gear] 5,059/05.

**Electrochemistry and Electrometallurgy:** A. PETERSSON [Calcium carbide furnace] 5,658/07.

**Switchgear, Fuses and Fittings:** NALDER BROS. & THOMPSON and A. F. HARRIS [Circuit breaker] 5,073/05; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Lightning arresters] 5,575/06; A. E. WOODHOUSE [Metallic conduits] 6,010/06; R. F. VENNEN and R. C. GRIESBACH [Automatic switches] 18,583/09.

**Traction:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Railway signalling systems] 6,135/07, 6,134/07, 6,135/07. H. PIERER [Petrol-electric transmission system] 5,159/08, 5,160/08; SIEMENS BROS. & Co. (*Siemens & Halske Akt.-Ges.*) [Railway signals] 5,698/08.

**Miscellaneous:** S. LEETHAM [Ozonising apparatus] 5,790/04; L. E. R. PHILLIPS [Musical instruments] 5,170/08; A. V. PRIOR [Clocks] 5,687/09; R. A. FESSENDEN [Utilising solar heat] 28,577/09.

### ANNOUNCEMENTS RELATING TO PATENTS.

*Small Prepaid Advertisements with regard to Patents, &c., are inserted on this page, facing our Patent Record, at 1d. per word (minimum 5s.); three insertions for the price of two. Rates for displayed, illustrated, and card advertisements on application.*

*Advertisement matter, accompanied by a remittance, should be addressed to the Kilowatt Publishing Co., Ltd., 203 Temple Chambers, London, E.C.*

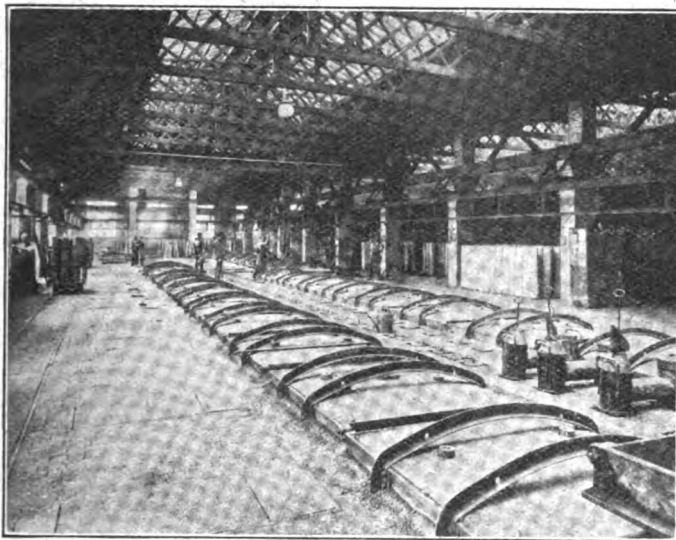
The Proprietor of the Patents 15,991 of 1909 and 26,341 of 1911 for "An Improved ELECTRIC LOCKING and UNLOCKING DEVICE FOR LOCKS," and "Improvements in ELECTRIC LOCKING DEVICES FOR LOCKS," is desirous of entering into arrangements by way of license and otherwise on reasonable terms for the purpose of exploiting the same and ensuring their full development and practical working in this country. All communications to HASELTINE, LAKE & CO., Chartered Patent Agents and Consulting Engineers, 28 SOUTHAMPTON BUILDINGS, CHANCERY LANE, LONDON, W.C.

## John E. Raworth,

Queen Anne's Chambers, Chartered Patent Agent  
30, Broadway, Westminster, London, S.W.

### G.E.C. CARBON WORKS

IN our issue of June 18th, 1914, a short account was given of the carbon works of the General Electric Co., which were open for inspection on the occasion of the I.M.E.A. visit to Wotton during the Convention. The illustration herewith will be recognised by those who visited this portion of



BAKING OVENS FOR ARC LAMP CARBONS.

the works as a view of the baking ovens, in which the rods are gradually heated up to the requisite temperature by being transferred from oven to oven, each succeeding oven being slightly hotter than the preceding one. When thoroughly baked, the rods are allowed to cool by being transferred gradually back to the coolest oven.

### ELECTRIC TRACTION NOTES

In the course of his Board of Trade Report on the collision which occurred at Burntisland on the North British Railway on April 14th last, Major Pringle calls attention to the fact that three of the coaches involved were lighted by gas and the remainder by electricity. On one of the former the gas caught fire, but owing to the position of the coach the flames were extinguished. The inspector writes that so much has been said in other recent cases upon the danger of the use of gas as an illuminant, that there is no need to write at length on this subject. "But I wish to point out," he continues, "that from my own examination I have no doubt that the origin of the fires in this case was burning gas, and that the gas jets from the undamaged cylinders, which were

not fitted with cut-off valves, appear to have burnt for a longer period than has sometimes been calculated."

The Highways Committee of the L.C.C. reports that the results of the 1913-14 year's working of the tramways show a deficit of £88,525, which is to be met out of the general reserve fund. This result is arrived at after the payment of £328,109 interest, and £408,488 repayment of capital. In a special report the Committee calls attention to the unfairness of motor-omnibus competition, and states that if the accounts of the Council's tramway undertaking were dealt with on a similar basis to those of the London General Omnibus Co., the result would be a return of 6½ per cent. on the capital expenditure. Figures are given, showing that whereas the tramway undertaking pays £187 10s. per tram-car towards public funds in the form of rates and taxes on track, licences and debt charges on contributions to street widenings, the Omnibus Co. only pays £37 4s. 6d. per 'bus. Special stress is laid on the fact that not only does the Omnibus Co. pay nothing towards road maintenance compared with the tramways undertaking, which is to a large extent maintaining the roadway for the benefit of its competitor, but that omnibuses also reap the advantage of street widenings towards which the tramway undertaking pay a large percentage. Steps are to be taken to improve the working of the tramways by linking-up the various lines and doing away as far as possible with dead ends.

The Aberdeen Suburban Tramway Co., which recently put into service several petrol-electric omnibuses, which travelled from London to Aberdeen under their own power, is shortly taking over another similar 'bus. An opportunity is to be afforded to any Aberdeen citizens to accompany the 'bus from London to Aberdeen should they desire to do so.

The Dundee Corporation has offered to purchase the Dundee, Broughty Ferry, and District Tramway Co. at £8,500. The Tramway Co., however, has asked for a sum of £15,486. Broughty Ferry was recently taken over by the Dundee Corporation under an Act of Parliament granted last year.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

At the annual meeting of the Marconi International Marine Communication Co. on Tuesday, Mr. G. Marconi presiding, a final dividend, making 10 per cent. for the year, was declared on the ordinary shares. The Chairman stated that it was a matter of great satisfaction that the Company was now soundly on its feet and earning reasonable dividends. Reference was made to the important part which the Company's installations have played in saving life at sea, whilst a complaint was made at the criticisms frequently levelled at the Company by Members of Parliament at its monopoly. Mr. Marconi, however, contended that nobody could assert that the Company had put its monopoly—if it possessed one—to an improper account.

Replying to several questions in the House of Commons last week with regard to the Imperial wireless telegraph scheme, Mr. Hobhouse said that several of the masts of the United Kingdom installation have been erected, and a considerable amount of material has been sent out to Egypt. Material was also on the point of being sent out to East Africa, India, and Singapore. The Post Office, however, was not at present in a position to undertake the work of erecting the three remaining stations. It was open to the Government, said Mr. Hobhouse, to cancel the contract with the Marconi Co. for these stations, and he was still prepared to consider the question of employing any other contractors who were able by means of practical demonstrations to satisfy him of the efficiency of their system.

Automatic telephone exchanges are apparently to be tried in Norway, as we learn that an automatic exchange is to be installed in Christiania at a cost of £55,000. The present number of subscribers in Christiania is 20,000 out of a population of 250,000.

On June 26th the Nagasaki-Tamsui cable failed, and a notification was issued stating that telegrams for Syria and Irak are no longer subject to delay.—The cable between Cayenne and Salinas was restored to working order on the 29th ult., and on June 30th, owing to an interruption between Constantinople and Angora, and between Constantinople and Konia, telegrams for Syria and Mesopotamia are being sent by a circuitous route involving delay.



## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 391. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**CHROMOLYTE BATTERIES.**—We have received from J. J. Eastick & Sons (Clapton Common, N.E.) a leaflet dealing with the "Chromolyte" primary batteries. These batteries, which are well adapted for use in hand-lamps, are said to possess several advantages over other types, amongst which may be mentioned high voltage, light weight, and ease of recharging. The electrolyte is made up in collapsible tubes, and may be conveniently stored in the lamp case until required. We are informed that no deterioration can occur, no matter how long these cells are kept in stock.

**"RAWLPLUGS."**—Revised prices of these useful plugs for enabling screws to be driven into any kind of wall are given in a leaflet from the Sun Electrical Co., Ltd. (118-120 Charing Cross Road, W.C.).

**IMMERSION HEATERS.**—A convenient hot-point immersion heater, pleasantly known as "El Boilo," is dealt with in a folder from R. W. Haylock & Son (63 Queen Victoria Street, E.C.). A number of other pieces of domestic electric heating apparatus are also listed.

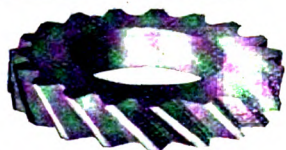
*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**CONDUIT FITTINGS, &c.**—A leaflet from Electrical Conduits, Ltd. (18 Bennett's Hill, Birmingham), describes a convenient conduit box which can be used as a connection or ceiling-rose box or for switches or pendants. Particulars are also given of a new form of adjustable die stock for screwing conduit tube.

**HALF-WATT LAMPS FOR PHOTOGRAPHY.**—A booklet from the General Electric Co., Ltd. (67 Queen Victoria Street), deals with the use of half-watt lamps for photographic studio work, a purpose for which they are eminently suitable, and lists a number of forms of special fittings and reflectors designed for the purpose. Special attention is called to the advantage of these lamps for autochrome work, as the quality of the light permits of shorter exposures being given than with other artificial illuminants. For most ordinary portrait work one 3,000-c.p. half-watt lamp is ample, and permits of shorter exposures than the usual arm lamp equipment.

**GLOVER'S ALMANAC.**—W. T. Glover & Co., Ltd. (Traford Park, Manchester), have sent us a copy of their popular daily sheet wall calendar, which covers the year from July 1st, 1914, to June 30th, 1915. This is the thirteenth of the series, and well upholds the high reputation which it has established. Each sheet contains a literary extract or an illustration of an instructive or humorous nature, in both cases well chosen, and with a variety which adds interest to each successive day.

## "Prana" Die Castings



will lighten your costs very considerably.

They leave the dies in a finished, ready-

for-use state, accurate to a degree only obtainable (by other methods) by long and costly "micro-machining." In addition to this each one is an exact duplicate of all the others—and so all die cast parts are automatically interchangeable, but they must be "Prana."

**AERATORS Ltd., UPPER EDMONTON, N.**

### LIGHTING OF THE SALVATION ARMY CONGRESS HALL

THE lighting installation of the large temporary hall built by Humphrey's, Ltd., on the Aldwych site for the Congress of the Salvation Army was undertaken by Francis Polden & Co. (56 Cannon Street, E.C.), who decided on the use of half-watt Osram lamps. Two distinct services are led into the building through two switch-fuse distribution boards in the entrance hall, where all control is effected. One service is taken from the ordinary 200-volt lighting mains, and the other from the special theatre mains, also at 200 volts, of the Charing Cross, West End & City Electricity Supply Co., Ltd. It is arranged that alternate lamps throughout are on the same service, so that the chance of the building being put into darkness by failure of the supply is extremely remote. All the wiring above 20 ft. from the ground is carried on porcelain insulators well away from any woodwork and the



THE SALVATION ARMY CONGRESS HALL.

walls. The interior lighting is by means of twenty-four 50-volt 300-watt half-watt Osram lamps, giving approximately 600 c.p. each, including one in the entrance hall. These are all enclosed in G.E.C. polished brass special half-watt fittings with "Superlux" bowls and reflectors. For the outside lighting on the Strand front two 100-volt 500-watt half-watt Osram lamps, of approximately 1,000 c.p. each, are enclosed in "First Citizen" lanterns with "Superlux" globes. The back entrance is lighted by four 200-volt 60-watt Osram lamps in G.E.C. watertight fittings, and all the exit notices are illuminated by means of Osram lamps of similar power. Over the steps an effective display is made by means of a strip containing thirty-two Osram lamps. The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), supplied the Osram lamps and the fittings. Francis Polden & Co. designed and carried out the lighting, and have also been responsible for the design and complete installation of the lighting of the new Kingsway Hall and the Salvation Army Congress Hall at Clapton.

**Demonstration of Electric Vehicles at Richmond.**—A demonstration of electric vehicles was held by the Richmond (Surrey) Electric Light & Power Company on the 18th inst. in the premises adjacent to the supply station, where the Company have accommodation which allows of a large number of cars being charged. The charging, handling, and trial running of the vehicles was shown to a number of the visitors. The Company look forward to doing considerable business in this direction in view of the facilities they can offer, and are actively pushing the matter by demonstrations and general advertising.

**Spare Automobile Lamps.**—Conveniently arranged cases of spare metal filament motor-car lamps are now sold by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), and by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street). The boxes are strongly made and the lamps well protected. The selection of lamps carried can, of course, be varied to suit individual needs, but a usual arrangement is two headlight lamps, two sidelight lamps, one tail or dashboard lamp, and such lamps of the festoon or tubular patterns as are employed for the interior lights.



**MARRYAT & PLACE**  
**ARMATURE REPAIRS**  
 DYNAMO & MOTOR HOSPITAL.  
 28, HATTON G<sup>n</sup> LONDON, E.C.

**A BASTIAN FOR**  
**METER 10/6**  
 GET A LIST OF REDUCED PRICES.  
 THE I. A. TIAN METER CO., Ltd.,  
 Reddish Town, N.W.

## BLAKE & INSULATING STAPLES

Write for Samples and Prices.

**MOSES & MITCHELL,**

Chiswell Works, 122-124, GOLDEN LANE, E.C.

**LOWERING GEAR FOR ARC & METAL FILAMENT LAMPS ELECTROLIERS ETC.**  
**IN STOCK**  
**THE LONDON ELECTRIC FIRM, CROYDON.**  
**IN STOCK**  
**WINCHES FOR ARC LAMPS GENERAL LIFTING PURPOSES**

**Ladders, Steps, Trestles, Scaffolds, &c.**  
 Sale or Hire.  
**HEATHMAN'S PLAIN DECORATOR'S TRESTLES.**  
 MADE IN TWO WIDTHS  
 10' AT TOP TO TAKE ONE SCAFFOLD BOARD,  
 20' AT TOP TO TAKE TWO SCAFFOLD BOARDS  
 "FOR SALE OR HIRE"  
**HEATHMAN & CO.**  
 10, Parson's Green, London, S.W.

Adopted by **NON-SHOK** Approved by  
 LEADING ENGINEERS FIRE OFFICES  
**Sand Tube Fire Extinguishers.**  
 Sample 1s. 9d. Three for 5s.  
**R. M. HALL, Williams Road, Moston, MANCHESTER.**  
 Sole Makers

## PHENIX ASSURANCE COMPANY, LIMITED.

ESTABLISHED 1782.

Head Offices: 19 & 70, LOMBARD STREET, LONDON, E.C.

TOTAL FUNDS EXCEED **£16,000,000** CLAIMS PAID EXCEED **£90,000,000**

CHAIRMAN: RT. HON. LORD GEORGE HAMILTON, P.C., G.C.S.I.

### FIRE - LIFE - ACCIDENT - MARINE

Loss of Profits following Fire, Workmen's Compensation, Fidelity Guarantee, Burglary, Trustee and Executor, &c.

#### ELECTRIC LIGHTING.

The Company has always encouraged the development of Electricity, and the well-known "Phoenix Fire Office" Rules for Electrical Installations are in use throughout the world. Copies will be supplied free on application to Head Offices.

General Manager: SIR GERALD H. RYAN.

## CAPPER PASS & SON, Ltd.,

Bedminster Smelting Works, BRISTOL.

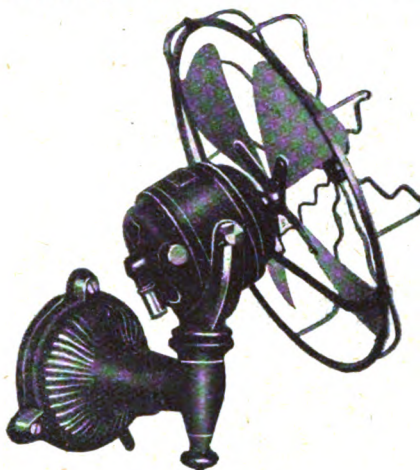
SELLERS OF  
**ANTIMONIAL LEAD OF ALL GRADES**  
 BUYERS OF  
**LEAD ASHES & LEAD RESIDUES FROM ACCUMULATORS**

Telegrams: "PASS, BRISTOL."

Telephone: 3475 & 3476.

## ELECTRIC FANS

A NEW list from Simplex Conduits, Ltd. (Birmingham and branches), gives particulars of the Company's line in electric fans, sewing-machine motors, small motor-generators for accumulator charging, polishing and buffing motors, and centrifugal fans. The range of fans includes all

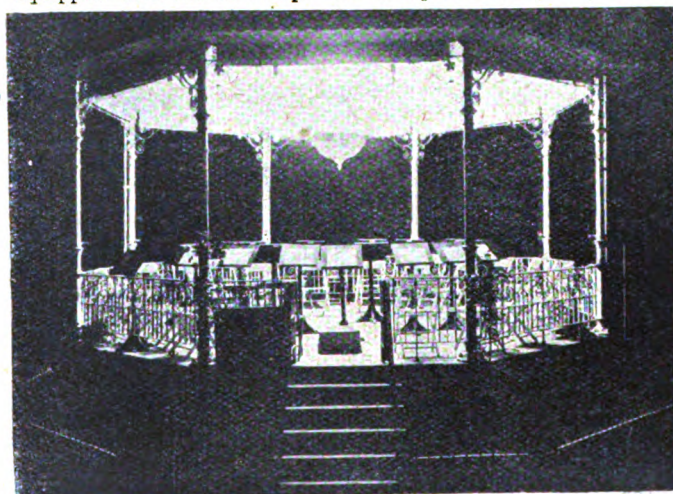


SIMPLEX FAN.

the usual types, from a simple desk fan of 10-in. diameter up to fans with box-blades 4 ft. in diameter. Prices are as low as is compatible with high-class materials and workmanship, as is instanced by the convertible-type bracket fan illustrated herewith, which is listed at 43s. Copies of the catalogue in question can be had on application to any of the Company's branches.

## INDIRECT LIGHTING OF A BANDSTAND

WHAT is believed to be the first example of the application of indirect illumination to the lighting of a bandstand is illustrated here. The installation is at Coventry, and consists of a single composition bowl "Eye-Rest" fitting equipped with Mazda lamps and X-ray reflectors, suspended



BANDSTAND AT COVENTRY WITH INDIRECT LIGHTING.

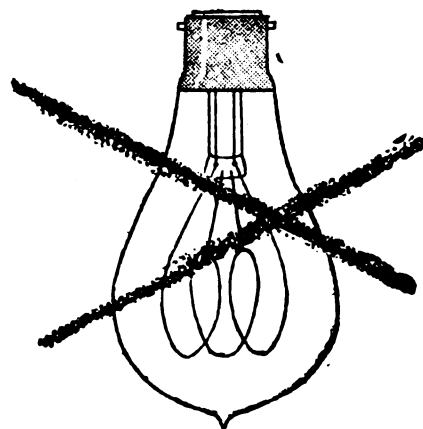
from the centre of the white ceiling. The illumination is ideal for the purpose. It is brilliant, yet absolutely glareless, and of course there are no inconvenient shadows.

At night the appearance of the bandstand is at once attractive and restful, and the musicians find the illumination better than anything they have met with for reading their music. We are indebted to the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), for the illustration.

**Siemens' Outing.**—Messrs. Siemens' Tantalum and Wotan lamp manufacturing department (Dalston) held their annual outing on Saturday last, when over 400 employees travelled by special train to Hastings. As in previous years, the firm bore the cost of travelling, leaving the individual members of the party free to make their own arrangements as to catering and entertainment. Mr. A. M. Hicks acted as secretary, and Mr. Le Marechal, Works Manager, accompanied the party, and in conjunction with the secretary spared no effort to ensure for those present a most enjoyable day's outing.



# Over 5,000,000 Carbon Lamps are in use to-day in Great Britain



The total current consumed by these carbon lamps represents, at a low price per unit, over £2,000 per hour of use.

Equal light can be obtained from MAZDA, OSRAM and WOTAN lamps at a cost of £500 per lighting hour.

MAZDA, OSRAM and WOTAN lamps, by reason of their sturdy drawn wire filaments, can be used wherever carbon lamps are used, and the consumer, while losing nothing in Durability, gains greatly in Economy and Brilliancy.

The profit to the Dealer on MAZDA, OSRAM and WOTAN lamps greatly exceeds the profit on carbon lamps.

## Replace Carbon Lamps with



# MAZDA

BRITISH  
THOMSON - HOUSTON  
COMPANY, Ltd. (B.T.H.).



# OSRAM

THE GENERAL  
ELECTRIC COMPANY,  
Ltd. (G.E.C.).



# WOTAN

SIEMENS BROTHERS  
DYNAMO WORKS,  
Limited.

## DRAWN WIRE LAMPS

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Aylesbury.**—Lighting and power switchboard, battery accumulators, mains, house-services, &c. Consulting Engineers, Kincaid, Waller, Manville, and Dawson, St. Stephen's House, Victoria Embankment, S.W. July 6th.

**Blackrock.**—Underground and overhead mains, feeder pillars, and public lighting. Consulting Engineer, J. P. Tierney, 15 College Green, Dublin. July 13th.

**Colwyn Bay.**—A new power-station at an estimated cost of £25,000 is to be constructed under the supervision of Mr. E. M. Lacey.

**Crook.**—Negotiations are being carried on with the Newcastle-on-Tyne Electric Supply Co. for a supply of electrical energy.

**Eastbourne.**—A Local Government Board inquiry was held last week concerning a loan of £4,656 for extensions to the generating plant.

**Gellygaer.**—The Council is inviting offers from consulting electrical engineers for the lighting of the district.

**Glasgow.**—First section of new Corporation Electricity Works, 35,000 kw.

**London: Hammersmith.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £15,500 for coal-storage tanks and transporting plant at the electricity works.

**Hampstead.**—A loan of £17,300, to meet the estimated capital expenditure during the year 1914-15, is to be applied for.

**St. Marylebone.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £5,524 for a 1,000-kw. converter and motor-driven centrifugal pump, &c., at the electricity works.

**Redditch.**—A Local Government Board inquiry is to be held on Tuesday concerning a loan of £18,000 for the extension scheme referred to recently in our columns.

**Truro.**—An application is to be made to the L.G.B. for sanction to a loan of £10,000 for the electric lighting scheme which Dr. Purves has prepared. Tenders are invited by July 4th for a suction gas plant equipment, together with mains, &c.

**Walsall.**—A Local Government Board inquiry was held last week concerning a loan of £74,850 in connection with the new power scheme which has been prepared by Mr. E. M. Lacey.

Four water-tube boilers with superheaters, economisers, and stokers; feed pumps and feed water heater; water softener, tanks, &c.; steam and exhaust pipes, &c. Consulting Engineer, E. M. Lacey, 12 Victoria Street, S.W. July 14th.

**Warrington.**—High- and low-tension cable. Borough Electrical Engineer. July 8th.

**Willesden.**—The Guardians are considering the question of taking a supply from the Council or putting down their own generating plant.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barrow-in-Furness.**—Contracts have been let for elementary schools.

**Croydon.**—Two hundred and eight houses. Norbury Avenue. Chesterton & Sons, 52-3 Cheapside, E.C.—Eighteen houses, Addiscombe Avenue. J. Weller, Dalmally Road.—Eleven houses. Ashburton Avenue. Paish, Tyler & Crump, 5 Station Road.

**Gloucester.**—School. Education Committee.

**Kidderminster.**—New public baths.

**Margate.**—Wiring of the Queen's bandstand and grounds. Manager.

**Manchester.**—Rebuilding premises in Dickinson Street after fire.

**Oldham.**—New mill. Belgrave Mills, Ltd.

**Rochdale.**—Cinematograph theatre, Yorkshire Street.

**Southampton.**—School. Education Committee.

**Swansea.**—School. Education Committee.

**Wigan.**—Cinematograph theatre. Eagle Picturedromes, Ltd.—New school at Pemberton.

### Miscellaneous

**Willesden.**—Flame arc lamps are to be substituted for the open type lamps in a number of streets.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Belfast.**—The tender of the British Westinghouse Co. for a 1,000-kw. rotary-converter has been accepted at £2,003.

**Devonport.**—A contract has been placed with the B.T.-H. Co. for a twelve months' supply of C.C. mercury ampere-hour meters.

**Wallasey.**—Messrs. Chamberlain & Hookham have received a contract for A.C. meters.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £62 5s. to £62 15s. (Last week, £63 5s. to £63 15s.)

**Branch Manager.**—Bruce Peebles & Co. have appointed Mr. E. W. Browne as their Birmingham office manager, in place of Mr. Hilton, who has resigned. Mr. Browne has been connected with Bruce Peebles & Co. for many years.

**Change of Address.**—The United States Metallic Packing Co., Ltd., have removed their London office to 116 Fenchurch Street, E.C.

**Plant for Sale.**—The Leeds Electric Lighting Department has for sale, four Lancashire boilers, a water-tube boiler, a Green's economiser, three 1,000 I.H.P. and a 500 I.H.P. Bellis & Morcom engines, a 800-kw. E.C.C. generator, and other plant.

**New Edison Showrooms.**—The new City showrooms of the Edison & Swan United Electric Light Co., Ltd., at 123-125 Queen Victoria Street, were opened yesterday. They are conveniently arranged, and in an excellent situation. We hope to publish a description of them in an early issue.

## APPOINTMENTS AND PERSONAL NOTES

Those of our readers who know Mr. E. Barralet, of Messrs. Pinchin, Johnson & Co., will regret to hear that he was taken seriously ill towards the end of last week, and has had to undergo an operation for appendicitis. On inquiry at his house yesterday, we were informed that he is making good progress.

At a meeting of the Council of the British Electrical and Allied Manufacturers' Association last week, Mr. F. R. Davenport, managing director of Willans & Robinson, Ltd., was elected to the office of Chairman of the Council, recently rendered vacant by the death of Mr. A. Bruce Anderson.

Mr. W. Dundas, already on the staff of the Manchester Corporation Electricity Department, has been appointed Resident Engineer at the Dickinson Street and Bloom Street stations, in succession to Mr. F. H. Whysall, who was recently appointed Chief Electrical Engineer to the Greenock Corporation. Messrs. E. Atkinson and J. H. Niven have been appointed Shift Engineers.

At the last meeting of the Keighley Town Council a recommendation to increase the salary of the Borough Electrical Engineer from £300 to £400 was negatived. An amendment that the increase should be £25 was finally passed, after the voting had first resulted in a tie.

The salary of Mr. J. W. Hadfield, Borough Electrical Engineer at Barnstaple, is to be increased from £200 to £225 per annum.

Mr. N. H. Barker, of Fulham, has been appointed Technical Assistant and Testing Engineer in the Stoke-on-Trent Electricity Department, at a salary of £140 per annum.

A junior used to common battery switchboard maintenance is required at Hull. (See advertisement on another page.)

FOR  
**STEAM JOINTS**  
USE



JOHN HUDSON & CO.'S SUCCESSORS, Mansell St., London, E.

## LOCAL NOTES

**Belfast: Report upon Electricity Undertaking.**—Sir John Snell, who has been asked to report upon the general position of the electricity undertaking, in conjunction with Mr. W. J. Pratten, formerly Manager of the Engineering Department of Messrs. Harland & Woolf, has prepared an interim report dealing with the necessity for installing additional plant, in order to carry the undertaking over next winter's load. It is in connection with this report that the recommendation to purchase a 1,000-kw. rotary-converter, referred to in our "Tenders Received and Accepted" column, has been made.

**Brighton: Increased Heating Output.**—In reporting a net profit of £2,342 on the past year's working of the electricity undertaking, as against £1,407 in the previous twelve months, Mr. John Christie, the Borough Electrical Engineer, states that there has been a substantial increase in the supply for cooking and heating, &c. The above result has been arrived at in spite of an increase 3½d. per ton in the price of coal. The quantity of coal consumed, however, has been reduced by further economies in the operation of the generating plant. An improved system of lighting the front is recommended, by which Mr. Christie anticipates doubling the illumination without materially increasing the cost.

**Bury: Progress of Electric Supply.**—Mr. S. J. Watson, the Borough Electrical Engineer, calls attention in his annual report to the fact that during the year no less than twenty-four factory chimneys have been put out of use by the adoption of electric power, and that fifty-one chimneys have now been put out of use altogether in a similar manner.

**Chester: Electricity Profits and Relief of Rates.**—Of the sum of £4,941 net profit from the electricity undertaking last year, £500 are to be allocated to relief of rates and £1,094 to meet the deficiency on the lamp rate. The balance is to be transferred to the reserve fund.

**Eastbourne: Electric Cooking and Heating.**—Mr. J. K. Brydges, the Borough Electrical Engineer, in his annual report, reminds the Council that electric cooking and heating in Eastbourne cannot progress under the present rate of 1½d. per unit, notwithstanding the fact that there has been some increase during the past year. This, however, has been mainly due to the only large cooking outfit connected to the mains being in use for the whole of the year, as compared with only six months during the previous year.

**Ely: Gas Co. Refused Electricity Powers.**—The Ely Gas and Electricity Co. recently applied for an electric lighting Provisional Order for this district, but the Board of Trade has refused to grant it.

**Exeter: Electricity Profits.**—The past year's working of the electricity undertaking shows a net profit of £1,446. It is proposed to deal with this surplus by granting a discount of 15 per cent. to the Lighting Committee, and reducing the charge for current to the tramways from 1½d. to 1¼d. per unit. The balance is to be used towards providing a new high-pressure turbo-alternator.

**Hull: Development in Bulk Supply.**—Quite a feature of the past year's working of the Hull Electricity Department has been the number of bulk-supplies asked for which involve substations on consumers' premises. These range from 650-kw. to 4,000-kw. capacity.

**Ipswich: Electricity Profits.**—There was a net profit of £1,351 upon the electricity undertaking last year, compared with a deficit of £74 in the previous twelve months. In that year, however, the results were abnormally affected by the coal strike, and the inefficient conditions of working incidental to the installation of the new plant. From the balance this year the sum of £904 is to be taken towards meeting capital expenditure, and the balance is to be carried to reserve and renewals fund.

**London: St. Marylebone: Electricity Accounts.**—The quantity of electrical energy sold last year, viz., 17,038,516 units, shows an increase of 2,036,229 over the previous twelve months. The average receipt per unit, however, has still further gone down from 3d. to 2-73d. per unit. After meeting capital charges amounting to £115,914, there is a net surplus of £4,525, compared with £4,014 in the previous twelve months. The effect of the new arrangements with regard to the Sales and Publicity Department has been to slightly reduce the salaries, and Mr. Seabrook expresses the opinion that the new arrangement will work satisfactorily when it comes into full operation. With regard to the new 3,000-kw. Oerlikon generating sets, the contract was that these would carry an overload of from 10 to 15 per cent. After the order was

placed, however, the contractors voluntarily agreed to an overload up to 4,200 kw. for six hours, whilst since the machines have been at work the normal load has been increased from 3,000 to 3,500 kw. each, and the plant is actually being run at loads as high as 4,700 to 4,800 kw. Similarly, the guarantee figure of steam consumption was 13¼ lb. per unit, but this has now been reduced to 11-8 lb. Reference is also made in the report to the extensive use of electricity for heating and cooking purposes, and in this connection Mr. Seabrook states that the owners of a certain block of flats are installing electric heating exclusively in the bedrooms, as it has been found that this form of heating is cheaper than most other forms. An entirely new source of revenue has also been tapped during the last six months by the installation of hot-water heaters.

**Salford: Cheaper Lighting Tariff.**—A proposal has been made by the Electricity Committee to reduce the charge for lighting to 3½d. per unit in Salford, and 4d. per unit in Prestwich.

• **Southport: Electricity Committee and Contractors.**—Considerable controversy is taking place between the local electrical contractors and the Corporation Electricity Department in connection with the proposal of the latter to open a showroom, and to deal with cookers and heating apparatus on hire. The contention of the Corporation is that the contractors have never made a move in this matter, and are not able to do so, and that the proposal will in no way interfere with the business which the contractors have carried on hitherto.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Coalite.**—At the annual general meeting of this company last week, reference was made to the low temperature system of carbonisation for the production of gas, and it was suggested that by the use of this for the production of electrical energy, the fuel cost in generating stations in this country could be reduced to something like 0-08d. or 0-07d. per unit as compared with the present cost of 0-25d. per unit.

**Otis Elevator Co.**—A circular announcing the amalgamation of the Otis Elevator Co. with R. Waygood & Co. has now been sent to the shareholders of both companies. The extensions of the Waygood factory in London will be carried out as speedily as possible, and it is intended to evolve one type of elevator apparatus which will comprise all that experience has shown to be best from the previous working of both companies.

**Trafford Power and Light Supply.**—After transferring £3,000 to depreciation, the net profit for last year amounted to £4,846. In reference to the proposal of the Manchester Corporation to purchase the company which was refused by Parliament, the directors state it is reasonable to anticipate that an offer of purchase in the near future may be received from some other source.

**J. G. White & Co.**—Mr. J. B. White, presiding at the annual meeting on Monday, said that the Company's principal field of action had been during the past few years in South America. The net profit for the year was £70,387, which was slightly smaller than in the two preceding years, but these results the directors were satisfied with having regard to the conditions of trade generally. The directors are asking for increased borrowing powers.

**Aron Meter Co.**—The annual meeting was held on Tuesday, Mr. H. Hirst presiding. Although the net profits for the year are £4,000 less than those of the previous year, the Company has done a larger business in Germany, England, and France. The business, however, in Austria-Hungary has suffered adversely to the extent of £8,000. The conditions there, however, have now resumed a normal position, and there is every prospect of the Company's business as a whole continuing to show satisfactory results.

**Witton Works Outing.**—On Saturday morning last over 600 of the employees from the Witton works of the General Electric Co., Ltd., travelled by special train to Bournemouth on the occasion of the annual works outing. Owing to the difficulty of finding accommodation for lunching so large a party, the largest skating rink in the town was required. Lunch and tea were partaken of here under the chairmanship of Dr. Railing.

**Electrical Installations Outing.**—The seventh annual outing of Electrical Installations, Ltd., took place on Saturday, June 20th. One section of the party travelled by char-a-banc to Hastings, and the other by train to Southend-on-Sea. The weather was all that could be desired, and both parties appeared to have had a very enjoyable time.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 393 [VOL. X., No. 28]  
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THURSDAY, JULY 9, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

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Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

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OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London." Telephone No.: 5509 Holborn.  
Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

AN illustrated article describes the latest forms of the aluminium electrolytic lightning arrester for high-tension line protection. (Page 394.)

A MOTOR generator installation for giving three-phase to special consumers from a D.-C. station is described. (Page 394.)

THE report of the Board of Trade Committee on explosions in connection with the use of bitumen in the laying of cables finds that such accidents have only occurred with separate single-core continuous-current cables. While not recommending the total discontinuance of laying cables solid in bitumen, in such cases they advise that each cable should be laid in a separate trough, and that other precautions be observed. (Page 395.)

THE wiremen's strike in London practically no longer exists. A note indicating the present position appears on page 395.

THE localisation of a particular kind of fault on a three-core cable is dealt with in our Questions and Answers columns. (Page 396.)

AMONGST the specifications published last week was one by Marconi's Wireless Telegraph Co. describing a method of increasing the frequency of electrical oscillations.—Application has been made for the restoration of a patent for improved switches.—M. I. Pupin's patent for the loading of telephone transmission wires expires this week, after a life of fourteen years. (Page 397.)

OUR Telephony and Telegraphy columns open with a description of the Carnarvon transatlantic wireless station. (Page 398.)

WE are now able to give details of the experiments of Colin and Jeance on wireless telephony. (Page 398.)

THE Marconi-Helsby Wireless Patent case was continued until Thursday last, when it was adjourned until Monday, July 13th. Evidence as to the persistence of the primary sparks in the defendants' apparatus was given. (Page 399.)

MR. OLIVER HEAVISIDE's Civil List pension has been increased, and Heaviside's work and the expiry of the Pupin "loading coil" patent are commented upon. (Page 399.)

THE Betulander Automatic Telephone Co. has developed an entirely new automatic exchange system in which relays entirely take the place of the usual electro-mechanical devices. (Page 399.)

THE first electric train for the L. and S.W. Rly. is now ready. (Page 399.)

IT is expected that the action of the Ilford Gas Co. against the Ilford Urban District Council with regard to supplying electrical fittings, and also alleging preferential terms in the matter of charging, will come on for hearing early next sittings. We suggest that the I.M.E.A. should take action in the matter. (Page 400.)

OUR Trade Section contains particulars of a new compact form of automatic cut-out for accumulator circuits. A new form of accumulator of light weight is also described. (Page 401.)

CABLE is required at West Bromwich; sub-station equipment at Hornsey; electrically-driven sludge pump at Ramsbottom; a 500-kw. rotary converter with transformers and switchgear at York; and large quantities of telephone apparatus in Australia.—An electric lighting scheme is under consideration at Criccieth. (Page 403.)

MR. J. H. BOWDEN, Borough Electrical Engineer, Poplar, complains of the revised list of repayment periods recently issued by the L.C.C.—Bulk supply agreements have been entered into between the Woolwich Borough Council, the South Metropolitan Electric Light & Power Co., and the West Kent Electric Co.—The Hackney Council has refused to appoint representatives to a proposed Committee of Borough Councils to investigate the question of bulk supply. (Page 404.)

THE reconstructed Crompton & Co. has had a successful first year.—The Consolidated Diesel Engine Manufacturers, Ltd., is to be wound up.—Edmundsons' Electricity Corporation show a satisfactory result of £23,125 last year, an increase of £4,225.—Some interesting information was given by the Chairman of the General Electric Company, at the Annual General Meeting last Friday, with regard to the satisfactory expansion of the Company's business. (Page 404.)

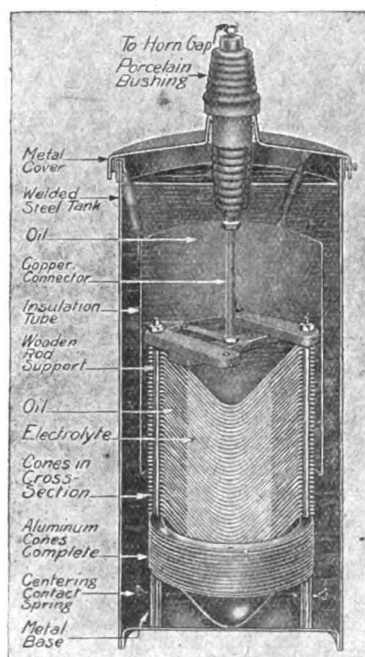
THE Robin Electric Lamp Co. is applying for a compulsory license to manufacture tungsten filament lamps and the application is to be resisted by the patentees. (Page 404.)



## ALUMINIUM LIGHTNING ARRESTERS

A RECENTLY issued pamphlet describes the latest forms of aluminium or "electrolytic" lightning arrester for high-tension alternating-current circuits supplied by the British Thomson-Houston Co. (Rugby). These are suitable for all potentials from 1,000 volts upwards, and one of their most important features is their two-fold discharge capacity. They have a discharge capacity limited by a series resistance sufficient for normal disturbances, and in reserve a large capacity limited ultimately by the resistance of the electrolyte. The principle of operation depends on the property of a film of aluminium hydroxide on the surface of two aluminium plates composing the cell, which, if in contact with a suitable electrolyte, have the characteristic of taking exceedingly small currents up to certain critical voltage, above which the current is only limited by the internal resistance of the electrolyte. The film is not broken down by this rush of current, but re-establishes its property of resisting the passage of current immediately. The critical voltage per cell is in the neighbourhood of 350 volts. In order to keep the cells in good condition, and to enable a low resistance electrolyte to be used, a horn gap is usually used in series, but as the protective film slowly dissolves when unconnected to the system, provision is made for connecting the cells directly to the system for a few seconds daily to re-form the film.

The construction of such an arrester, which consists of a series of inverted cones one above another in a tank of oil,



SECTION OF ALUMINIUM LIGHTNING ARRESTER.

is shown in the illustration. The cones are insulated from one another except for the electrolyte, while the oil prevents the evaporation of the solution. Four stacks of cones are provided, connected together at a common point, three of them being connected to the lines, and the fourth to earth. This system ensures the provision of an adequate number of cones to withstand conditions arising on one line becoming earthed, without requiring the provision of an excessive number of cones between lines. In arresters for circuits of 1,000 to 7,250 volts all the cones for the three phases are placed in one tank, but above 7,250 volts a separate tank is supplied for each stack. In order to limit the current which flows into the arrester during the period of charging and during the time of breaking the arc, the horn gaps are constructed with an auxiliary horn and resistance mounted above, and insulated from, the regular horns, so as to intercept the arc if it arises on the latter. Sufficient resistance is connected in series with the auxiliary horn always to limit the current and arc across the gap to a moderate value. Thus light discharges will pass across the smaller gap to the auxiliary horn and through the series resistance to the cells, but if the discharge is heavy the resistance offers sufficient impedance to cause the spark to pass to the main horn. This is accomplished with only a slight increase in potential because the gap is already ionised. If the cells are in normal condition the spark at the gap is immediately extinguished

without any flow of dynamic current. A transfer switch is provided for interchanging the earth stack with one of the line stacks during charging, so that the films of all the cells will be formed to the same extent.

## MOTOR-GENERATORS AT OLDHAM

THOUGH generating low-tension continuous-current power, the Oldham Corporation was recently called upon to supply three-phase energy to a consumer. For this purpose, and also in connection with three-phase turbo-generators which it was proposed to install in the power-house, the two 500-kw. 6,600-volt 50-cycle synchronous motor-generators running at 500 r.p.m. seen in Fig. 1, were laid down. The continuous-current generators have a voltage range of 410/520 volts, and are provided with separate exciters

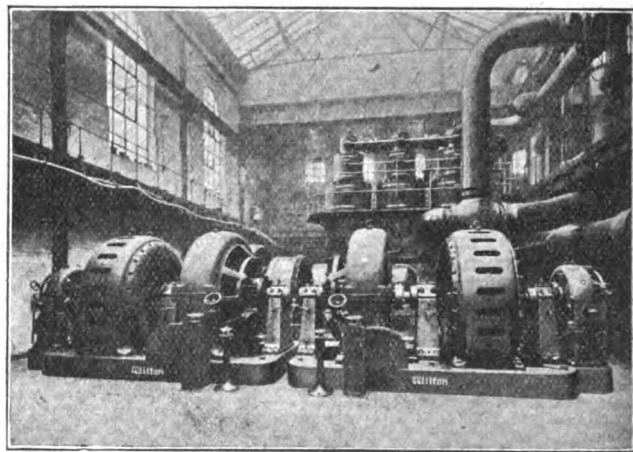


FIG. 1.—MOTOR GENERATORS AT OLDHAM ELECTRICITY WORKS.

carried on an extension of the shaft at the alternating-current end. Owing to space limitations the machines had to be very compactly designed. The sets are started from the continuous-current side by liquid starters. After they are run up to speed and synchronised, the liquid starters are short-circuited. The starters, although situated in the basement, are actuated from the engine-room floor by a handwheel on a pillar, on which is also mounted the short-circuiting switch. The short-circuiting switch and the starter are interlocked, so that the former can only be closed with the switch in the "on" position. The interlocking device is

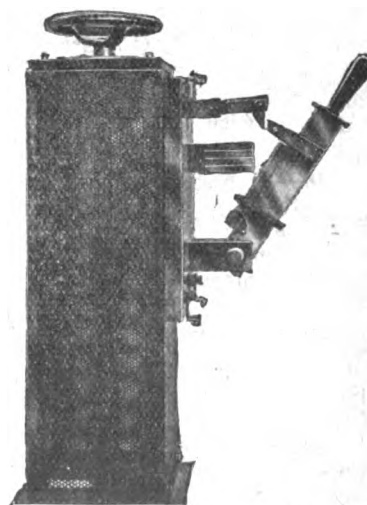


FIG. 2.—STARTER CONTROL PILLAR.

shown in Fig. 2. The rotation of the handwheel raises or lowers the small catch seen above the upper contact of the switch. With the catch down, which corresponds to an open position of the liquid starter, the switch cannot be closed. If the switch is pulled out, the catch rises to enable this to be done, but flies back to a position from which it obstructs the switch if any attempt be made to replace it. The motor-generators and switchgear were supplied by the General Electric Co., Ltd., of Witton, Birmingham, and 67 Queen Victoria Street, London, E.C.

## ELECTRIC MAINS EXPLOSIONS

THE report of the Departmental Committee on Mains Explosions appointed by the Board of Trade to consider the causes of explosions which have occurred in connection with the use of bitumen in laying cables at Nottingham, Hebburn, and elsewhere, has now been issued. The Committee consisted of Sir T. E. Thorpe, F.R.S. (Chairman), Mr. R. Nelson, Mr. W. Slingo, Mr. J. Swinburne, and Mr. A. P. Trotter, with Mr. M. J. Collins as Secretary. A number of witnesses, including several engineers of large electricity undertakings, were examined.

During the past eleven years six or seven explosions due to vapour generated by short circuits on cables have taken place in houses, and a number in the streets. On investigation it was found that none of these occurred on alternating current by concentric or three-core cables or lead-covered, paper-insulated cables. "There remain," continues the report, "the class of single-core, separately-laid cables, insulated with india-rubber or with vulcanised bitumen. Although at one time vulcanised rubber cables of excellent quality were made, and it appears might still be made at a higher price, inferior qualities have given trouble. . . Vulcanised bitumen has been the material used for insulating the cables in all the cases of serious explosions in houses, and these have been drawn into bitumen casing, or laid in bitumen on the solid system." It is remarked, however, that the manufacture of bitumen casing has practically ceased.

In discussing the various causes of deterioration of bitumen, it is stated that it is softened by contact with coal-gas, but no case of explosion has been traced to this cause. A fault on a positive cable produces corrosion and eventual interruption of the copper conductor, but a fault on a negative decomposes the insulating material, and not the conductor, and moisture is attracted by osmosis, causing the bitumen to become pulpy. When the resistance of the cables is sufficient to control the current, the heat may only melt the surrounding bitumen, causing it to flow in and quench the arc. If, however, the arc persists, the vulcanised bitumen and the bitumen in which the cables are laid is melted. Both vapour and gas are driven off. At the high temperature which is present the vapour is "cracked", or dissociated into gas in considerable volume, and if in a confined space, under considerable pressure. When these products can force their way and escape through the surface of the roadway or between the joints of paving stones there is a chance that the arc may burn itself out, either by flooding of bitumen or by failure of current consequent on the lengthening of the arc owing to melting and volatilisation of the copper. If owing to an impervious pavement the gas is forced, or if having free access it passes into a house and becomes ignited, an explosion may be the result.

The immunity of alternating circuits may be due to their smaller size, or to the absence of osmotic action, and it is suggested that the absence of such accidents in three-core and concentric cables is due to the more serious nature of a short-circuit, resulting in better protective systems in such cases, and the necessarily higher class of jointing. In the solid system bitumen and pitch-compound are the only practical filling materials. The latter is cheaper, and has a lower melting point, and is apparently not affected by creosote or by coal-gas. "While more gas is given off on heating pitch than on heating bitumen, only two minor explosions of street boxes have been recorded where pitch has been used, and it must be remembered that street-box explosions are often due to the sudden expansion of air by the heat of a heavy short-circuit." There appeared from the evidence to be considerable difference of opinion regarding the best material for troughs.

"It appears," continues the report, "that a condition precedent for a serious explosion is to be found where two or three separate vulcanised bitumen cables are laid solid in bitumen in one trough. The experience of breakdowns has led to certain improvements in carrying out the solid system, and where conditions are such that lead-covered, paper-insulated cables or armoured cables laid direct in the ground cannot be recommended, the solid system carefully laid with due precautions has its advantages, but it ceases to be a cheap method. Earthenware troughs with separate chases or a separate trough for each cable is the best method, but it is expensive and occupies a good deal of space." In some cases accidents may have been due to breakdown of service-joints, but there is some difference of opinion among the witnesses on this point. The Hebburn accident was due to three preventable causes. At a corner where the direction changed 40°, wooden troughs were merely mitred together:—(a) Not only had the

two cables been pulled up against the wood, but the outer one had been pulled until it rode over the other, and so remained for eleven years, when a fault developed. (b) An impervious continuous cement pavement was laid over the cables. (c) The cables were laid close to the foundations of a house and these consisted of loose rubble with no lime or cement. In most cases where explosions have occurred an impervious pavement of concrete or asphalt had been laid over the mains. It is found that with a flagged pavement the gas can escape between the joints. In three cases of explosions services have been so laid that access was given to the interior of houses, and gas freely entered. Most witnesses agree that services should be solidly bricked in, armoured cable being generally preferred. There was general agreement that services should not be carried in on the solid system. After discussing at some length the testing of cable networks for insulation, and their fusing and division into districts, the final conclusions of the Committee are given as follows:—

The Committee finds that the explosions to which its attention has been directed have occurred in connection with electric supply by continuous current through separate cables, for the most part insulated with vulcanised bitumen and either drawn into bitumen casing or laid solid in troughs filled with bitumen.

The Committee finds that no serious explosions have occurred where the supply has been by alternating current, or where concentric or three-core, or lead-covered paper-insulated cables have been used, or where cables have been laid solid in pitch-compound; but a direct comparison between bitumen and pitch-compound cannot be made as the former material has been more extensively used than the latter.

In view of the small number of serious accidents which have occurred, compared with the large extent to which vulcanised bitumen cables laid in solid bitumen have been used, the Committee is unable to recommend the Board of Trade to discontinue to approve of this system.

In view of conflicting opinions of witnesses the Committee cannot recommend that iron or stoneware troughing should be used to the exclusion of wood, but they recommend that wood troughing should be used only where it can be ascertained that the soil is suitable; that where separate mains are laid in troughing each cable should be laid in a separate trough, and that between the troughs there should be a space not less than 2 in. tightly packed with earth or sand.

The Committee recommends (1) that separate mains for continuous-current supply should not be laid on the solid system below impervious pavements or close to the walls of houses; (2) that easy bends should be laid at corners, and the bitumen or pitch-compound should be poured after the straight lengths have cooled; (3) that where sharp corners of troughing are suspected to exist the mains should be opened up and the corners eased; (4) services should be taken into houses (preferably by the use of armoured cables) in such a manner that gas cannot enter.

The Committee also recommends that the special attention of engineers of electric supply undertakings should be called to Section 38 of the schedule to the Electric Lighting (Clauses) Act, 1899, and to No. 12 of the Regulations made by the Board of Trade for securing the safety of the public, which require notification of accidents by explosion or fire, or any other accident of such kind as to have caused, or to be likely to have caused, loss of life or personal injury which have occurred at any part of any electric line or work, in order that the circumstances may be investigated, and, when necessary, reports made on them.

The Committee is strongly of opinion that such reports should be published for the information of those concerned.

In an appendix is given the report of Dr. R. V. Wheeler of the Home Office Experimental Station, Eskmeals, on the gases evolved from bitumen on a pitch at different temperatures, and showing their high degree of inflammability. The separate reports of Mr. A. P. Trotter (Electrical Adviser to the Board of Trade) on the explosions in Hamilton Place, Piccadilly, and Pall Mall in 1908, in Battersea Park Road in 1909, in the Strand and in Nottingham in 1911, and at Hebburn in 1913, are also printed at the end of the report, which can be obtained from Wyman & Sons, at the price of 8d.

**The Wiremen's Strike in London.**—This strike may now be regarded as a thing of the past. The minimum wages of 10½d. per hour for wiremen duly came into force on July 1st in accordance with the working rules of the London Electrical Masters' Association, and we learn that as many men are to be had by the various firms as are required. The jobs are practically divided into those on which union men work and on which non-union men work, and in some cases, we believe, both union and non-union men are employed by the same firms, but not on the same jobs. The amount of work is, however, still very limited in consequence of the continuance of the builders' strike.

## QUESTIONS AND ANSWERS

### BY PRACTICAL MEN

#### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

#### QUESTION No. 1,399.

A Hartmann & Braun hot wire voltmeter is used on A.C., and has a scale of 0-250 volts. It is desired to use this instrument for a range of 0-500 volts by multiplying present scale by two. How can this be accomplished?—METER.

(Replies must be received not later than first post, Thursday, July 16th).

#### ANSWER to No. 1,397.

A fault occurs on a 7/16 3-core paper, lead-covered and armoured cable 300 yds. long, laid direct. On testing, it is found that each core has gone to earth, and also burnt clear from the remaining portion of the cable. Two-thirds of the cable is in the middle of a road at a depth of 3 to 5 feet, the remainder under paving-stone in the pathway. State the most reliable test for locating this fault to avoid opening up as much as possible.—ADSUM.

Although several replies have been received, none appears to us to meet the circumstances of the case with sufficient completeness and practical detail, and no award is therefore made.

The procedure we should recommend is as follows:—

Adsum's description of the case is represented by Fig. 1 or Fig. 2; it is, of course, not known whether the fault has occurred in the part of the cable under the roadway or under the pavement. It is to be assumed from his description that the conductors are burnt clear both from themselves and earth at the side beyond the fault.

Send a gang to open the pavement at A.

While this is being done, measure the resistance between the ends marked 1 & 2, 2 & 3, and 1 & 3. If this is greater than 0.65 ohm, which is the resistance of two cores for the full length of 300 yards, it is no good proceeding further with resistance measurements, as the resistance of the fault is greater than that of the cable. On the other hand, if the three measurements are under 0.65 ohm and are steady and all practically identical, it is possible that the three conductors are well fused together at the fault, and, as a first approximation therefore the distance of the fault may be taken to be

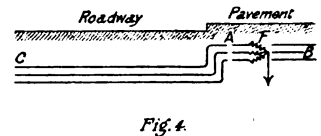
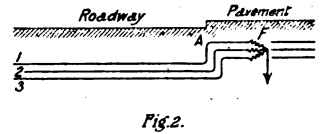
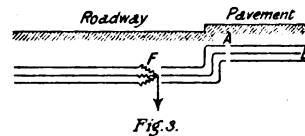
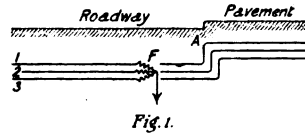
$\frac{2 \times 0.001086}{0.001086}$  yards (0.001086 ohm is the resistance of 7/16 cable per yd. at 60° F.). It may be taken for granted that the distance of the fault from the station is not greater than this.

If the engineer is a quick worker, he will probably have made this test and have had time to survey the spot indicated before the footpath at A is open and the cable ready to cut. If his inspection of the spot indicated by his calculation gives no clue as to the fault being near there, he should proceed to cut the cable at A, and test each way. He will then see at which side of A the fault is, and have the conditions either of Fig. 3 or Fig. 4. If the conditions are as shown in Fig. 3, he should take a capacity measurement on the known length AB, and then another towards the fault on the length AF, and the distance of the fault from A will be in proportion to the capacity.

If the conditions are as in Fig. 4, a capacity measurement

on the known length AC should be taken, and another from the end B towards the fault, and the distance of the fault from B will be in proportion to the capacity.

In taking these capacity measurements, connect all three



cores together, earth to the lead of the cable for a few seconds to discharge the cable, and then take a capacity swing, in the usual way, on charging with a battery between the bunched cores and the lead of the cable through a galvanometer. If it is possible to use the same battery and galvanometer under precisely the same conditions for the two tests, it is only necessary to compare the swings, as these may be taken as approximately proportional to the capacity.

If it has been possible to take a useful resistance test as mentioned in the first instance, compare the result of this with the result of the capacity test, and take the result which gives the fault nearer to the station end for the reason already indicated.

#### Conversazione of the Institution of Civil Engineers.—

The Conversazione last Thursday of the Institution of Civil Engineers was the first that has been held in the handsome new building in Great George Street, which proved sufficiently commodious to accommodate comfortably the 3,000 guests that were received by the President, Mr. A. G. Lyster. The interest of the evening was added to by the very fine collection of engineering models and instruments on view in the reading rooms and other rooms on the ground-floor. Among these specimens of historic submarine telegraph cables were shown by Mr. Charles Bright, and a number of pieces of wireless telegraph apparatus were exhibited by Capt. H. R. Sankey and Marconi's Wireless Telegraph Co. These included a demonstration of the new wireless distant-control apparatus used for controlling fog signals (referred to in another part of this issue), a large collection of instruments, and a model showing the method of construction of high steel masts. Other interesting exhibits were working models of the old Betulander and Post Office automatic telephone systems. Messrs. Waygood & Co. showed a working model electric lift. Miners' electric safety lamps were shown by Mr. H. F. Joel, and samples of corrugated rails from the L.C.C. Tramway system by Mr. A. L. C. Fell. The musical portion of the programme included songs by Miss Agnes Nicholls to the accompaniment of the string band of the Royal Engineers. The Westminster Singers and Mr. Percy Godfrey's English String Sextet also contributed to the enjoyment of the evening.

**Complimentary Dinner to Sir John Snell.**—A general desire has been expressed that the honour of Knighthood recently conferred upon Sir John F. C. Snell, President-Elect of the Institution of Electrical Engineers, should be made the occasion of a complimentary dinner in the early autumn, and a Committee is in course of formation to make the necessary arrangements. Those wishing to associate themselves with the event are requested to send their names as soon as possible to any one of the following:—P. F. Rowell, The Institution of Electrical Engineers, Victoria Embankment; D. N. Dunlop, British Electrical & Allied Manufacturers' Association, King's House, Kingsway, W.C.; A. H. Dykes, Association of Consulting Engineers, 11 Victoria Street, S.W.; H. Faraday Proctor, Incorporated Municipal Electrical Association, The Exchange, Corn Street, Bristol; L. G. Tate, Electrical Contractors' Association, 20 Bucklersbury, E.C.

**Works Outing.**—The employees of the Western Electric Co. to the number of over 150 travelled by special boat and special train to Clacton-on-Sea on Saturday, June 27th, on the occasion of their annual outing. A sports meeting was held on the Clacton Football Ground.

**A Fatal Joke.**—A curious electrical fatality is reported in the *Times*. A high-tension transmission line near Potsdam had broken, and the line ends were lying on the ground, when ten workmen seeking to "amuse themselves with electric shocks," joined hands and picked up the wires. All were thrown to the ground, and five were killed on the spot.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published July 2nd, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

9,930/13. **Water Heaters.** R. WEAVING and FERRANTI, LTD. An improved type of heater for household use, enabling small quantities of hot water to be drawn off in a short time, with only a small heat loading, larger quantities being available after a longer time. The heater is provided with an inner container of small capacity, in which the heating element is arranged. The water in the inner container heats up rapidly, and in expanding overflows into the body of the heater, so that a slow circulation is set up. Two taps are provided, one for drawing very hot water directly from the inner container, the other for cooler water from the body of the heater. Eight figures.

13,006/13. **Ignition Apparatus.** UNTERBERG & HELMLE. This invention describes the construction of a magneto, yielding an e.m.f. curve having several small peaks instead of one comparatively large and pointed peak. One projecting edge of each of the two pole shoes is perforated by a number of closely set drilled holes which give the edge a grid-like formation. Two figures.

13,637/13. **Frequency Increasing Apparatus.** MARCONI'S WIRELESS TELEGRAPH CO., LTD., and C. S. FRANKLIN. The source of A.C. current of which it is desired to increase the frequency is connected in series with a rectifier and a polarising direct voltage of requisite strength, which may be in the same direction as, or opposed to, that half of the current which normally passes through the rectifier. The rectified current is led through the primary of a suitable transformer, having a secondary connected to a capacity, and tuned to have a time period equal to half that of the original voltage. The frequency of the induced voltage in the secondary will then be double the original frequency. By using two or more transformers with primary and secondary circuits suitably arranged, higher transformation ratios can be obtained. During working, the battery which is used to supply the polarising voltage may become charged, and the surplus energy can be utilised to help to drive the alternator through a motor. The apparatus is, of course, particularly adapted for producing high-frequency oscillations for wireless signalling. Four figures.

25,018/13. **Railway Signalling System.** SIEMENS BROS. & Co. and J. BOOR. A system in which a battery of moderate size is made to supply an alternating or pulsating current, by means of a vibratory converter of the well-known type, to the insulated rails of a block section. The primary terminals of a transformer are connected across the rails at the other end of the section. The secondary winding of the transformer is connected in series with the operating coil of track relay. The tongue of this relay is in circuit with the coil of a second slow-acting relay, which controls the local circuit for operating the signals. When no train is on the section, the first and second relays are both closed, and the signals are kept in the required positions. When a train enters the section, the primary of the transformer is short-circuited, so that the first relay opens and allows the second relay to open after a short time. Any stray direct current, such as a leak from the traction circuit, cannot get beyond the transformer primary. The momentarily large fluctuation which may occur in the secondary due to such current would not be persistent enough to allow the second relay to close. Two figures.

25,393/13. **Copper-plating of Iron and Steel.** S. O. COWPER COLES. The iron or steel is thoroughly cleaned by pickling or sand-blasting, washed in running water, and dipped into a concentrated solution of nitric acid. When the evolution of gas ceases, the metal is again washed in running water and transferred to an electro copper depositing tank. The connection of the anode and cathode must be made before the steel is immersed in the electrolyte, which consists of a solution of potassium cyanide and copper sulphite in water. When the steel has received a good coating of copper, it is washed in hot water and transferred to a copper sulphate depositing tank, where the deposition is continued to any desired extent.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 3d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** SIEMENS SCHUCKERTWERKE GES., 9,960/14.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** WATERS [Reverse power relays] 13,418/13; FRANKUM [Insulators] 29,839/13.

**Dynamos, Motors, and Transformers:** FYNN [Dynamo-electric machines] 11,214/13; ARNO [Transformers] 11,539/13; WHITE-SIDE [Motors] 18,178/13; VON LEPEL [High-frequency transformers] 3,171/14.

**Electrometallurgy and Electrochemistry:** SCHULTE [Electroplating] 743/14.

**Ignition:** SCHUBERT [Magneto] 13,983/13; R. BOSCH [Interrupter] 10,683/14.

**Incandescent Lamps:** GRANN [Metallic filament lamps] 26,713/13; BLOCH [Filament support] 2,025/14; ELLINGER [Portable lamps] 5,024/14.

**Switchgear, Fuses, and Fittings:** HOPE [Blow-out apparatus] 9,109/13; SANDYCROFT, LTD., and DUTTON [Controller gear] 14,043/13; B.T.H. Co. (*G.E. Co., U.S.A.*) [Couplings] 15,074/13; TYLER, FREEMAN, and SHREWSBURY [Watertight switch] 17,761/13; HART [Switch control] 1,982/14; LUTLEY [Lamp fittings] 7,165/14.

**Telephony and Telegraphy:** WILSON [Production of h.t. discharges] 13,755/13; SIEMENS BROS. & Co. and PETTITHORY [Number dial for automatic systems] 14,614/13; CARTER [Telephone arm] 15,607/13; SIEMENS & HALSKE ART.-GES. [Automatic telephone systems] 22,850/13; SCHIESSLER [Wireless telegraphy and telephony] 29,447/13; FLEIJEL and OLSSON [Loading of telephone lines] 8,185/14.

**Miscellaneous:** SCOTT [Clocks] 13,715/13; DFARLE [Signalling apparatus] 23,478/13; GIRARDELLI [Distant control of guns] 198/14; AUB [Electric baths] 6,093/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, and Transformers:** A.E.G. [Insulation of winding coils] 14,044/14.

**Storage Batteries:** R. BOSCH [Terminal connections] 7,686/14.

**Telephony and Telegraphy:** THORNBLAD [Train telephony] 13,854/14; BIENVAUX [Telegraphic code apparatus] 14,276/14.

**Traction:** CIE. GÉNÉRALE DES OMNIBUSES DE PARIS [Current collectors for tramways] 14,098/14.

**Miscellaneous:** CADENAL [Locks] 13,715/14; SIEMENS SCHUCKERTWERKE GES. [Machine tools] 14,021/14.

### Application for Restoration

27,196/03. **Improved Switches.** C. H. HUNTER. Application has been made for the restoration of the above Patent which expired in December, 1911, owing to non-payment of fee. Notice of opposition may be given on or before Sept. 1st, 1914.

### Opposition to Grant of Patents

13,282/12. **Manufacture of Ductile Tungsten.** Dr. P. SCHWARZKOPF, Dr. S. BURGSTALLER and WOLFRAM LAB. Dr. I. P. SCHWARZKOPF. An appeal has been lodged from the Comptroller's decision to allow the grant of this Patent.

25,606/12. **Time Limiting Device.** J. G. STATTER. The grant of this Patent has been allowed by the Law Officer.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

12,733/00. **Reducing Attenuation of Electric Waves.** M. I. PUPIN. This specification relates to the loading of telephone transmission lines. The object is to enable impulses to be sent along the line with comparatively small currents, so that heat losses and therefore attenuation effects are minimised. Inductance coils are situated at equal intervals along the line, the exact number, and the self-induction of each coil depending upon the capacity and resistance per unit length of the line, and the maximum frequency of the impulses. A formula is given for determining the wave length of these impulses, and it is desirable though not essential, to allow 16 coils per wave length. Ordinarily no iron cores are required for the coils, but in the case of submarine cables, where it is necessary to enclose the coils in the sheathing of the cable, an annular laminated steel core is used for each coil. Twelve figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors and Transformers:** A. E. G. [Dynamo excitation] 6,312/09.

**Electrochemistry and Electrometallurgy:** E. CRUMIÈRE [Treating cellulose] 2,794/08.

**Incandescent Lamps:** H. T. GRAINGER [Annular lamps] 18,799/09.

**Telephony and Telegraphy:** G. W. PIERCE [Wireless telegraphy] 5,351/07; T. CLARK [Syphon recorder] 6,525/09.

**Traction:** ARMSTRONG, WHITWORTH & Co., and J. HONNER [Train lighting] 6,409/07.

**Miscellaneous:** J. GARDNER [Submarine signalling apparatus] 6,239/06; W. FAIRBURN-HART (*Electrolle Co.*) [Musical instruments] 5,728/08; H. LAKE (*G. Pino*) [Gripper for submarines] 6,164/09.



## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

### The Carnarvon Transatlantic Wireless Station.

The *Wireless World* contains a description of the new Marconi Transatlantic wireless stations near Carnarvon which have been recently opened. The transmitting and receiving stations are separate. The former is on the Cefn-du mountains, a few miles east of Carnarvon at a height of about 680 ft., and the receiving station to which it is connected by four land-lines is at Towyn, about sixty-two miles away. Such a long distance is not necessary, but was chosen owing to certain geographical features which allowed of the correct angular bearing of the stations. The transmitting station consists of a building about 83 by 100 ft. The main transmitting sets are in duplicate, each comprising a 300-k.v.a. single-phase alternator generating at 1,750 volts 150 cycles, and an exciter driven by a 500-B.H.P. 440-volt three-phase motor. The alternator is directly coupled to the rotary disc discharger, which is in a sound-proof room, by an insulating coupling, but an independent motor is provided so that the latter can be run asynchronously if required. The transformers, of 75 k.v.a. each, and the low-frequency inductances, are in a separate room with a complete equipment of safety and isolating switches. Although normally all operating is done from the receiving station, there is an emergency operating room, which also contains a master switch controlling the transformer safety switch, the receiving aerial isolating switch, the recovery crystal protecting switch, an illuminated sign "Ready to Transmit" in the shift engineer's office, and a disconnecting switch to the main earth lead. In an annexe is a considerable amount of auxiliary plant, including D.C. motor-generators, blowers, ventilating fans for the dischargers, &c. Practically all this plant is in duplicate. The condensers are arranged in tanks on two floors with the pots three in series. The "jigger" or oscillating transformer is of the independent primary and secondary type, and consists of a suitable number of turns of special H.F. cable wound on insulated frames which can be shifted axially to vary the coupling. Three aerial tuning inductances are provided. The aerial is of the directive type extending up the mountain side to a length of 3,600 ft., and averages 500 ft. in width. It is supported by ten tubular steel masts 400 ft. in height, and a ring of buried metal plates. Power is supplied at 10,000 volts three-phase by the North Wales Power Co.'s Cwm Dyli water-power station, eleven and a half miles away, and is stepped down to 440 volts in an adjoining sub-station. The receiving aerial at Towyn is supported by five masts, each 300 ft. high, erected on the hill at the back of the town, with the last mast about 1,400 ft. above sea-level. A balancing aerial is also provided to compensate for the effect of signals transmitted from Cefn-du, and this is carried on 80-ft. poles. The equipment can deal with 100 words per minute duplex. The signalling switches at the transmitting station are controlled from Towyn, where the punched tape from the Creed instrument is put through a Wheatstone transmitter, which by means of relays at Cefn-du actuates the signalling switches, making and breaking 300 kw. The station is in direct communication with the Company's headquarters at Fenchurch Street and Marconi House by direct landlines. The station with which Carnarvon is to communicate is at Belmar, New York. It is hoped that the equipment will also be able to be used for wireless telephony, and Mr. Godfrey Isaacs (Managing Director of the Marconi Co.) announced last week at a meeting of the Dominions Royal Commission that Mr. Marconi contemplated that directly he had made a few mechanical arrangements at Carnarvon, he would be able to telephone to New York.

### The Colin-Jeance System of Wireless Telephony.

Reference was made in *ELECTRICAL ENGINEERING* of June 18th, on page 384, to the overhearing by Mr. E. F. Blaze, at his station in Lincolnshire, of a conversation in Paris during experiments with the Colin-Jeance system of wireless telephony. We now hear through the Anglo-French Wireless Co., Ltd., from their affiliated Company, La Compagnie Générale de Radiotélégraphie, of Paris, that the telephonic messages in question emanated from their station at the Rue des Plantes, Paris, which has an antenna of only 164 ft. in height, and not from the Eiffel Tower as then stated. In view of the small aerial used, the result is even more remarkable. Through the courtesy of the Company we are now able to give some particulars of the Colin-Jeance system. The

continuous waves employed are produced by three arcs connected in series, each with a negative carbon electrode of 1.5 mm. in diameter, and a disc-shaped copper positive electrode which forms part of the base of a cylinder filled with paraffin and cooled by water circulation. The arcs burn in an atmosphere produced by mixing acetylene and hydrogen generated from calcium carbide and calcium hydride, respectively, in the same producer. This atmosphere prevents burn-

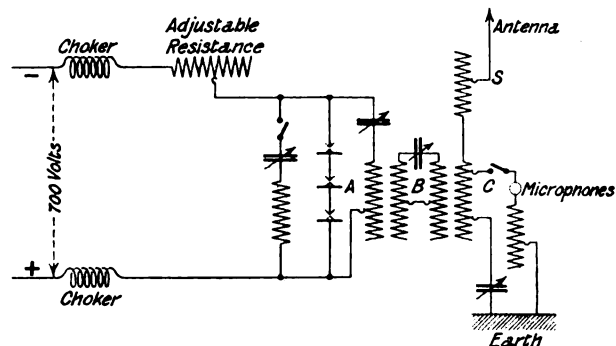


DIAGRAM OF CONNECTIONS.

ing of the carbon electrodes; in fact, they actually increase in length slightly. The arcs can be hand-controlled by separate regulators, but only very slight variation occurs. The supply voltage from the dynamo may be varied by shunt regulation from 500 to 750 volts, the current consumed varying from  $3\frac{1}{2}$  and  $4\frac{1}{2}$  amperes. From the diagram it will be seen that the current is led through choking coils and a steady adjustable resistance. The voltage at the terminals of the three arcs in series, where the oscillatory circuit is tapped off, is from 250 to 350 volts. When the oscillatory circuit is broken in passing from transmission to reception this voltage falls to approximately 150 volts, and a resistance is automatically inserted to compensate for this drop in voltage. The principal oscillatory circuit consists of an inductance and variable condenser, connected in parallel with the arcs A. An intermediate oscillatory circuit, B, consisting of an inductance and variable condenser is utilised to couple the principal circuit with the antenna, and ensures that multiple waves generated in the main circuit are not transmitted to the antenna, the result being that only a single wave is emitted. The antenna circuit consists of an inductance coupled with the circuit B and a variable condenser. A variable self-induction is also used in the aerial. The microphone circuit consists of nine carbon microphones connected in series and so arranged that they are all acted upon by the voice simultaneously by means of a megaphone. The microphones are connected between the variable inductance of the oscillation transformer and the earth, as shown at C. This has the double advantage of avoiding sparking, such as always occurs in the microphones when they are placed directly in the antenna, and does not limit the energy which can be taken by the microphones. The station has two complete microphone equipments, with a change-over switch, so that one can be allowed to cool while the other is in use. The station is also arranged for telegraphic transmission with a musical note, the pitch of which may be changed at will. The transmitting coils consist of flat spirals of copper strip, and the condensers are of the glass-plate type. Arrangements are provided for very exact tuning by means of variable air condensers. The wave-length of transmission can be varied between wide limits. In official tests a wave-length of 985 metres was used.

### Marconi Wireless Telegraph Patent Case.

The hearing of the case between Marconi's Wireless Telegraph Co. and the Helsby Wireless Telegraph Co. was continued until Thursday last, when it was adjourned until Monday, July 13th. It will be remembered that Dr. Murray, in course of examination by Mr. Jaffé, exhibited a spark photograph taken from the experimental apparatus. Under the conditions of the experiment witness had calculated that seven complete oscillations would occur before the amplitude had been reduced to one-tenth of its initial value. The photograph showed nine complete oscillations. The inference was that the spark photographs, which had been used in con-

structing some of the curves previously shown, could be taken as a fairly correct indication of the true nature of the spark.

In cross-examination by Mr. Walter, the witness was not prepared to deny that when cadmium electrodes were used for obtaining the spark, the oscillations were seen to persist for a much longer time than could be seen with copper electrodes. He admitted that, up to a certain point only, tightening the coupling of the two circuits increases the rapidity with which the energy is transferred from the primary to secondary. Mr. Walter drew attention to a statement given in Dr. Murray's "Handbook of Wireless Telegraphy," p. 243, 1911 Edition, that below 50 per cent. coupling the energy transference increases with increase of tightness of the coupling. Also that the energy transmission decreases with increase of the decrement of the primary circuit.

Mr. Terrell re-examined the witness who stated that he was still of opinion that defendant's apparatus did not contain a persistently oscillating primary.

Mr. Walter then recalled Mr. Pletts, who gave evidence of having conducted some experiments on an installation at Chelmsford, made to correspond with the alleged infringing apparatus. He inferred from these experiments that, under ordinary working conditions, there would be at least about 15 complete oscillations in each primary spark, so that in his opinion, the primary circuit was comparatively persistent.

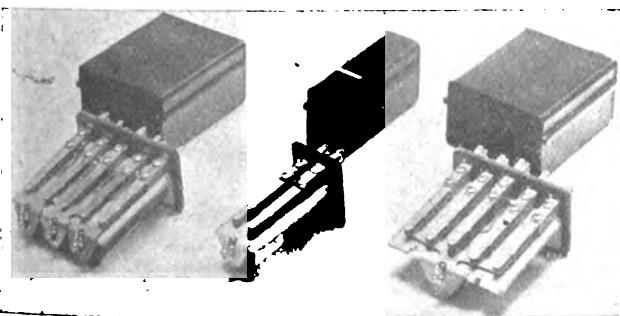
After a brief re-examination of this witness by Mr. Terrell, the hearing was adjourned until Monday, July 13th.

### Oliver Heaviside: The Pupin Patent.

Telephone engineers will welcome the announcement that Mr. Oliver Heaviside's Civil List pension has been increased by £100. In 1896 Mr. Heaviside, who lives in retirement in the west of England, was granted a small pension, practically just sufficing for the necessities of life, and this increase is, at any rate, a recognition by the Government that the enormous developments in long-distance telephony and the economies in the cost of long-distance lines in recent years have been primarily due to his early work. It is an interesting coincidence that, in the same month as this announcement the Pupin patent, covering the use of distributed inductance in the form of coils in telephone lines, should be expiring, after a life of fourteen years, which must have brought large sums of money in royalties to the patentee. Pupin, both in his patent and writings, developed the fundamental doctrine enunciated by Heaviside, but practically unheeded years before, that distributed inductance in cables and lines must be beneficial to speech transmission. The patent, which, as mentioned in our Patent Record on another page, expires next Tuesday, gives itself an extremely clear exposition, aided by a mechanical analogy, of the function of the inductance, and gives clear calculations (with numerical examples) for determining how it should be inserted in the line. It was never contested during its life, although, so broad are the claims, that it practically covered any arrangement of inductance coils distributed in series throughout the length of a telephone line.

### New Automatic Telephone Exchange System.

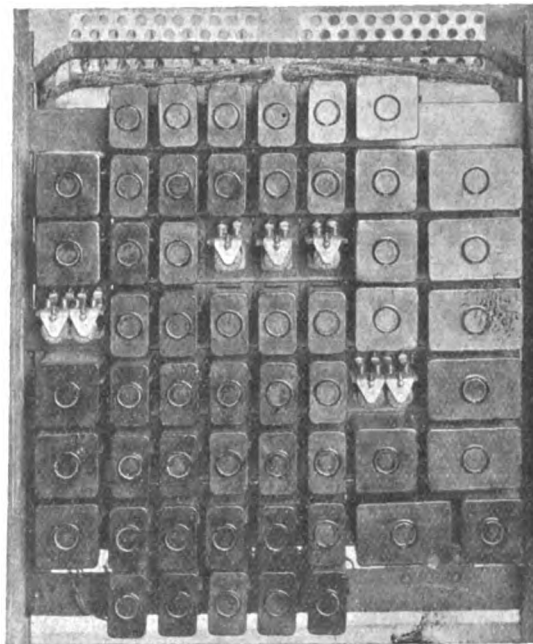
We have been privileged to inspect a full-sized skeleton model of a new automatic telephone exchange system which may eventually revolutionise the present methods of automatic exchange construction. The Betulander Automatic Telephone Co., Ltd. (a Company affiliated with the Marconi Co., and with offices in Marconi House, Strand, W.C.), have taken up a new system which has been developed by Mr. Betulander, in conjunction with Mr. Palmgren, to supersede his ingenious automatic exchange which was only introduced a year ago.



SOME OF THE RELAYS.

In the new system all the connections and all operations are done by relays; there are no other electro-chemical devices. A series of "link lines," comparable in a way with the double cord circuits of a manual switchboard, or perhaps better with the vertical and horizontal bars of the original Edison peg switchboard, are allocated to each group of five

subscribers' lines; relays at the crossing points actuated by a group of relays called an "out-going searcher"—one of which is allocated to every 100 subscribers—connect to a free junction, and then the connections are made junction to junction by means of relays, and finally by an "incoming searcher" to incoming junction lines, and the link line of the called subscriber. The subscribers' lines are thus not multiplied at all, and the only multiplying in the ordinary sense is that of the junction lines, which are multiplied into



FRONT OF FIVE-SUBSCRIBER SECTION.

each group of five subscribers. The illustration above shows the front of one of the five-subscriber sections; the subscribers' line relays are at the bottom, and the junction wires enter at the top. The relays for all purposes do not differ materially in construction from ordinary relays; three different types are seen in the second illustration. The Company owns the patents of the system for all countries, except Sweden, and is now strongly staffed for its development work. It is under the leadership of Mr. C. B. Clay (late London Superintendent of the National Telephone Co.) and Mr. Arthur Williamson (late of the Western Electric Co.), and Mr. W. Aitken (late of the Automatic Telephone Mfg. Co.) joined the staff a few months ago as Technical Adviser. An actual exchange for Marconi House is to be the first constructed.

The Telephone Co. of Pernambuco, with a capital of £100,000, has been registered. The first directors have not yet been appointed, neither has the address of the registered office been filed.

Telegrams for Albania since the 1st inst. have been subject to great delay, and Tirana Elbassan, Kavaja, Shiak, and Pegin are entirely isolated, the wires having been cut.—The Ahvaz-Mohammerah line is down, and on the 6th inst. communication between Constantinople, Konia, and Angora was repaired.—One of the cables of the Pool Atlantic Cos. required attention of the ship recently, near the English shore.

### ELECTRIC TRACTION NOTES

We much regret that by an error the surface-contact tramways at Lincoln were referred to on page 331 of our issue of June 11th as being on the Dolter system. This should, of course, have been the "G. B." system. There are now no tramways at work in this country on the Dolter system.

The first of the new electric trains which have been constructed by the L. & S.W. Ry. at their Eastleigh works, consisting of a motor-coach and two trailers, is now complete, and is to be tested on the District Railway.

The promised capital reduction scheme of the British Electric Traction Co. has now been issued. It provides for writing down the capital by £908,372, and consolidating the four classes of stocks into two classes, viz., 6 per cent. cumulative preference stock and ordinary stock.

## GAS COMPANY'S ACTION AGAINST THE ILFORD ELECTRICITY DEPARTMENT

THE interesting action between the Ilford Gas Co. and the Ilford Urban District Council, with regard to the alleged illegal spending of money on electrical fittings, and also preferential charging, was mentioned in the Chancery Division before Mr. Justice Sargant on Friday. Mr. Mark Romer, K.C., who appears for the Gas Co., said that the Council had given an undertaking not to deal further in fittings until the action, and he had only to refer to the question of preferential charging. The point was, he said, that in December last the Council issued a new tariff intended to apply only to premises electrically lighted throughout, and this tariff, he contended, was a discrimination fully covered by his lordship's judgment in the Long Eaton case (ELECTRICAL ENGINEERING, May 14th, 1914, p. 266). This was a matter of argument rather than evidence, and in the circumstances he did not know what course Mr. Martelli, on behalf of the Council, proposed to take, having in view the difficulty at this time of the year of fixing an early trial for next sittings. The new scale came into force on January 1st.

Mr. Martelli, K.C., said he was prepared to continue his undertaking not to deal in fittings until the trial of the action, but with regard to the alleged preference, this, he argued, was certainly not within the Long Eaton judgment, which was a case of preference in charging as between the use of electricity for light and power. In this case the new tariff applied to consumers who at present use both electricity and gas for lighting, and was intended to induce them to use electricity solely for lighting, as by so doing they became better customers to the electricity undertaking. The new tariff did not interfere with the existing ones, and the con-

sumers still had the right to avail themselves of the existing tariffs.

Mr. Justice Sargant said it seemed to him that the damage done was that other consumers who did not use electricity absolutely would be placed in the position that their competitors in business would be trading upon more favourable terms.

Mr. Martelli said the Council alleged that the effect of the new tariff was precisely the same as the old, but that the new one was so framed that consumers could understand it very easily.

Mr. Justice Sargant said in the circumstances he did not think it was a matter he could dispose of on motion, and as the matter was not so very urgent, it could be left over until the trial next term.

This action, as well as the action against the Long Eaton Urban District Council, may be regarded as part of a campaign organised by the Gas Companies' Protection Association, which is a powerful body. It would certainly be advantageous if the I.M.E.A. were to take the matter up on behalf of the electricity undertakings, not necessarily to fight every action brought against an electricity department for alleged preferential charging, but to issue a clear definition to its members as to what is and is not preferential charging, and to fight those cases for them whenever there is an endeavour to attack the principle of this definition. Cases, on the other hand, in which Local Authorities without hiring powers have hired out motors, do not, we think, call for the intervention of the I.M.E.A.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 403. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**MOTOR-CAR ACCESSORIES.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have issued a revised list of electrical accessories for motor-cars which includes coils for cars where battery ignition is still used, sparking plugs of the Lodge, Geeko, and other varieties, and a very full range of switches for ignition and car lighting circuits. Pocket and other voltmeters and ammeters for testing ignition and lighting cells are also listed, and a special feature of the list is the extensive range of interior lighting fittings. Head, side, and tail lamps are listed in various qualities, and complete lighting plants are represented by the C.A.V. and T. & M. systems. Batteries are dealt with in profusion, and mention should also be made of the motor-generators, switchboards, &c., for charging, and last but not least the latest type of Osram drawn wire lamps for motor-car lighting.

**LAMP HOLDERS, &c.**—A very large number of varieties of Edison screw lampholders, including many for special purposes, are listed in a catalogue of "P. & S." wiring devices manufactured by Pass & Seymour, of Solvay, N.Y., U.S.A.

**AIR COMPRESSORS.**—We have received from Alley & MacLellan, Ltd. (Sentinel Works, Polmadie, Glasgow), a fine, bound, illustrated catalogue of 160 pages giving particulars of air compressors of capacities from 25 to 25,000 cu. ft. of free air per minute, and containing a large amount of useful information regarding the uses of compressed air.

**ARC LAMPS AND ELECTRICAL PLANT.**—A conveniently arranged bound pocket catalogue from the Union Electric Co., Ltd. (Park Street, Southwark, S.E.), contains prices and particulars of complete ranges of arc lamps, dynamos and motors, switchgear and instruments.

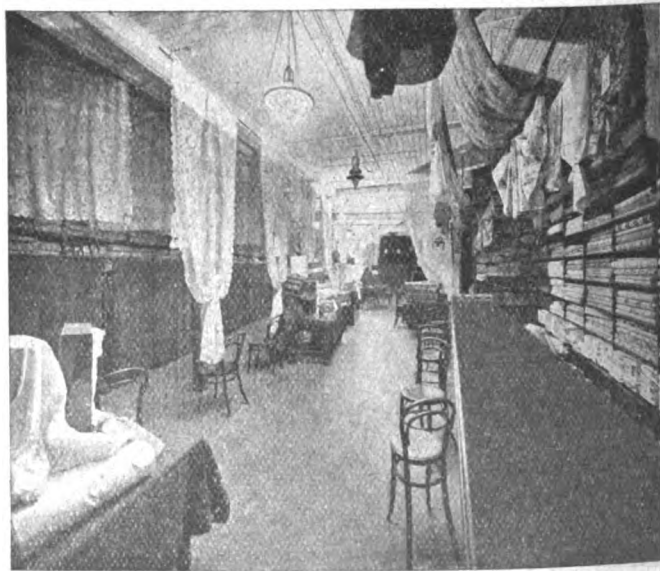
**INSULATING TAPES.**—A leaflet from John MacLennan and Co. (30 Newgate Street, London, E.C.) deals with their various insulating tapes.

**WET AIR FILTERS.**—A leaflet from Ozonair, Ltd. (96 Victoria Street, S.W.), describes the system of cooling and washing large quantities of air which is used in connection with Ozonair ventilating plants, and is also applicable to the treatment of air for cooling turbo-generators.

**HIGH-PRESSURE SWITCHGEAR.**—A list from J. H. Holmes & Co. (Newcastle-on-Tyne) deals with oil break switches for switchboard mounting with automatic trip gear arranged in front of the panels.

### HALF-WATT LAMPS FOR SHOP LIGHTING

SIEMENS BROS. DYNAMO WORKS, Ltd., of Tyssen Street, Dalston, send us the photograph reproduced here showing the use of Wotan half-watt lamps at Williams & Thomas's stores, Broadway, Stratford. The photograph was taken entirely by the light of these lamps, which had been running for over three months without any breakages. The

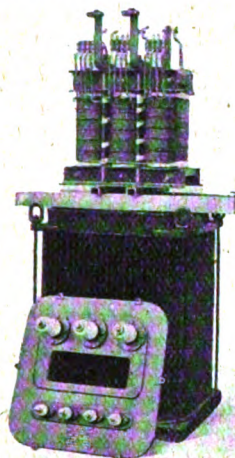


HALF-WATT LAMPS IN THE CURTAIN DEPARTMENT OF A LARGE STORE.

lamps are of 1,000 c.p., and are contained in semi-indirect fittings with opal glass bowls, which give an even illumination without glare over a very wide area. We understand that these lamps, which have replaced small arcs, have given such satisfactory results that Messrs. Williams & Thomas have decided to place them in other parts of their stores where space warrants such a unit being used.



# SMIT TRANSFORMERS



**RELIABILITY. LOW IRON LOSS.  
CLOSE REGULATION.  
GOOD OVERALL EFFICIENCY.  
COMPETITIVE PRICES.**

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CODE—A.B.C., 5th Edition.

## A SMALL AUTOMATIC ACCUMULATOR CUT-OUT.

A NEW accumulator cut-out has been introduced by Nalder Bros. & Thompson (97A Dalston Lane, N.E.) to meet the demand for a smaller apparatus than the well-known Crawley pattern. This is known as the Beta midget automatic switch, and, like the Neville instrument, has a permanent magnet. This, however, is arranged so that it cannot be reversed; in fact, the action of the switch in use is to reinforce the magnet instead of reversing it. The apparatus is purely differential in its action, and is connected up in the manner indicated in the diagram. As in the original

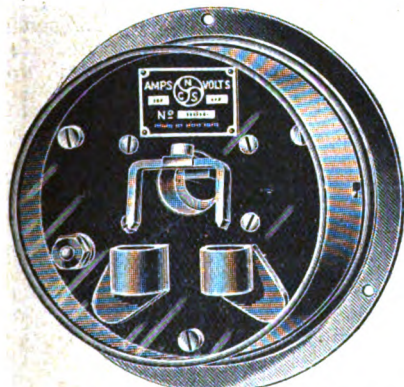


FIG. 1.—FRONT VIEW OF A MIDGET ACCUMULATOR SWITCH.

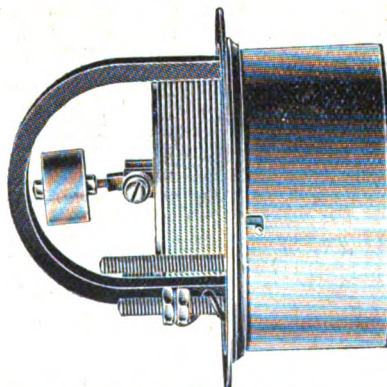


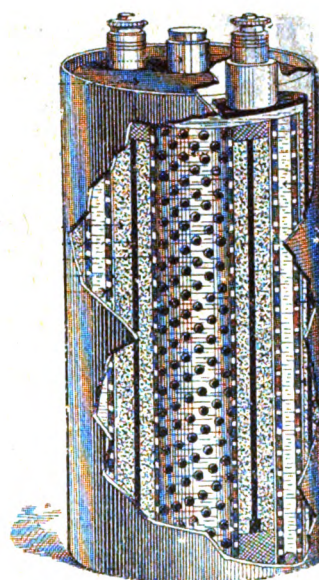
FIG. 2.—SIDE VIEW OF SWITCH.

pattern of midget automatic battery switch, minimum weight is secured in the moving part, as the differential coil is wound on the same bobbin as the current coil, and not on the moving iron, consequently the mass to be moved is considerably less than is the case in some instruments which work in this manner. Compactness in design is secured by arranging for part of the instrument to be let in flush with the board, only that part of the mechanism carrying the mercury

cups and the dipper stands out on the front of the board. These are protected by a glazed polished brass case, which can be easily removed. This is a point of advantage, as instances have occurred, where skilled labour is not employed, that the dipper has been tampered with. Generally speaking, this instrument is only made for voltages up to 80 volts, and currents up to 50 to 60 amperes. The diameter of the hole which it is necessary to cut in the board is only  $5\frac{3}{8}$  in. This instrument is very compact, and is of neat appearance. The usual finish is polished brass, but nickelled or dull black cases can be supplied if required.

## THE PHOENIX ACCUMULATOR

A STORAGE battery embodying some interesting features is being introduced by Phoenix Accumulators (60 Wilson Street, Finsbury Square, E.C.). It is a lead-sulphuric acid battery, but, owing to the way in which the active material is supported, all possibility of buckling of plates, internal short-circuits, or falling-out of the lead oxides, is claimed to be prevented. The construction is shown in the section of one of the smaller sizes of cell given here.



CROSS-SECTION OF PHOENIX CELL.

The electrodes are tubular and concentric, and are composed of antimonial lead surrounded by the active material of finely granulated lead oxide retained by perforated tubes of slightly elastic material lined with flexible sheaths of a very porous material, and kept in position by india-rubber separating rings. The outer container is not perforated, and forms the wall of the cell. The electrolyte is able to circulate freely between the granules of active material, while a construction of considerable mechanical strength is obtained.

A special feature of the cell is the high proportion of active material which can be used, forming as much as 42 per cent. of the total weight, and the large effective surface in contact with the electrolyte. Consequently a very good weight-efficiency is obtained, amounting to 16.4 watt-hours per lb. of total weight, or 44 lb. per

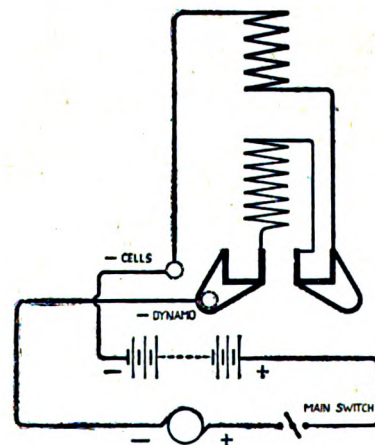


FIG. 3.—DIAGRAM OF CONNECTIONS.

h.p.-hour output. A life of 300 charges and discharges is claimed to be obtainable without any deterioration. Phoenix cells are listed in various forms, from 6 to 120 ampere-hours, for ignition, motor-car, and train lighting, and other purposes where a light portable battery is required; and a miner's lamp fitted with one of these batteries is made, giving 2 c.p., and weighing 3 lb. 5 oz. We understand that traction batteries on this system have also been made.



# EDISWAN NEW SHOWROOMS

123—125

**QUEEN VICTORIA STREET**

COUNTER ENTRANCE :—229, UPPER THAMES STREET

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**ARE NOW OPEN  
FOR THE SALE OF**

ROYAL EDISWAN DRAWN WIRE LAMPS  
EDISWAN ACCESSORIES — HEATERS  
RADIATORS — FANS — ELECTRIC IRONS  
FANCY FITTINGS — GLASSWARE  
— AND ALL ELSE ELECTRICAL —

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WE HAVE RECENTLY OPENED A SHOWROOM AT  
71, VICTORIA STREET, S.W. PLEASE NOTE WHICH  
OF THESE ADDRESSES SUITS YOUR CONVENIENCE  
AND CALL IN WHEN NEXT PASSING.

# NOW OPEN

The Edison & Swan United Electric Light Co., Ltd.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Criccieth.**—The Lighting Committee recommends that the question of gas be entirely excluded from its investigations into the public lighting scheme, and that only electricity be considered.

**London: Hornsey.**—A Local Government Board inquiry has been held concerning a loan of £13,744 for the provision of a sub-station at Muswell Hill. One member of the public was present. The estimated cost of the plant is £9,394.

**West Bromwich.**—In order to meet some large new power contracts, additional cable, estimated to cost £2,080, is to be installed.

**York.**—A 500-kw. rotary-converter with transformers and switchgear. July 13th. City Electrical Engineer.

### Wiring

**Greenock.**—Electric wiring and fittings for Academy. Clerk, Municipal Buildings, Wallace Square. July 23rd.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdeen.**—New training centre. Architect, J. A. Allan.

**Doncaster.**—Cinematograph theatre, St. Sepulchre Gate.

**Dudley.**—New municipal buildings.

**Honley.**—New municipal offices.

**Itchen.**—Isolation Hospital.

**London.**—Telephones, bells, &c., at Joyce Green Hospital, near Dartford, for Metropolitan Asylums Board. W. T. Hatch, Chief Engineer, Victoria Embankment.

New Theatre, St. Martin's Lane. Architect, W. G. R. Sprague.

**Lowestoft.**—New buildings and alterations to Town Hall. Borough Surveyor.

**Manchester.**—New factory, Dantzic Street. Architect, A. Sykes.—Warehouse, York Street. Architect, G. Westcott.—Warehouse, Charles Street. Architects, T. Cook & Sons.—Bank, Wilmslow Road. Architect, W. R. Sharp.—Cinematograph theatre, Coupland Street. Architects, Henderson & Brown.

**Newcastle-on-Tyne.**—New baths at Benwell, Walker, and Heaton. Surveyor, Town Hall.

**West Bromwich.**—Additions at Infectious Hospital.

### Miscellaneous

**Ramsbottom.**—Supply and erection of electrically-driven sludge pump with motor, wiring, counter-shafts, gearing, &c. James Diggle & Son, Hind Hill Street, Heywood.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Accrington.**—A contract has been entered into with the Chloride Electrical Storage Co. for maintaining the battery at the electricity works for eight and a half years at an annual charge of £166.

**Clones.**—The Board of Guardians has accepted the tender of the local electric lighting company at £50 for the lighting of the workhouse.

**Darlington.**—The following tenders have been accepted by the Electricity Committee: Water-tube boiler, Babcock & Wilcox; cooling tower, Balcke & Co.

**Edinburgh.**—The contract for the electrical installation at the Redford Cavalry Barracks has been placed with Lowdon Bros. of Edinburgh.

**London: Hammersmith.**—The tender of the British Electrical Transformer Co. for six 100-kw. transformers at £486, and for so many 50-, 100-, and 200-kw. transformers as may be required during the year ending June 30th, 1915, at £49 5s., £81, and £125 each respectively, is recommended for acceptance. Other tenders were received from the Foster Engineering Co., Ferranti, Ltd., Brush Electrical Engineering Co., Burnand & Co., William Smit & Co., Brown Boveri & Co., at varying prices. The accepted tender is the lowest for

100- and 200-kw. transformers, and the second lowest for 50-kw. transformers. It was also the second lowest in the period for delivery, viz., eight weeks, compared with six weeks offered by Ferranti, Ltd.

**L.C.C.**—The Highways Committee recommend the acceptance of the tender of the Brush Electrical Engineering Co. for the provision of 150 trailer cars, and the equipment of 200 cars with couplers and traction gear for drawing trailers, at £74,200.

**Manchester.**—The following tenders have been accepted by the Corporation: Five to 6,000-kw. turbo-alternator for Stuart Street Station, British Westinghouse Co.; cable supplies, Western Electric Co. and Chas. Macintosh & Co.; welding rail joints, Tudor Accumulator Co.

**Wrexham.**—The following tenders have been accepted by the Electricity Committee: Dynamo, Lancashire Dynamo Co., at £616 10s.; engine, Belliss & Morcom, at £1,055; condenser, British Westinghouse Co., at £389.

Among recent orders for "Pulsynetic" electric clocks now being carried out by Gent & Co. (Faraday Works, Leicester) are the following installations:—Two C.P.R. boats now building; a new liner for Patrick Henderson & Co.; the Allan Line offices at Montreal; Delhi Station, East Indian Railway; Dominion Bank, Toronto (fifty dials, mostly in marble cases); Henry Birks & Son, Vancouver, B.C.; large striking and chiming turret clock for new Grey Institute, Port Elizabeth, S.A.; turret clock and fifty dials for Australia; astronomical clock for Odessa Observatory; St. Mary's Church, Northampton (four-dial turret clock); Messrs. Ardol, Ltd., Selby; De Montfort Public Hall, Leicester (four-dial hanging clock); Children's Hospital, Leicester; Watson Laidlaw, Glasgow (twenty dials and time bells); Glasgow Corporation (Tramways); Aberdeen Station, N.B. & Caledonian Railways; St. George's School (Glasgow, turret clock with chiming gear); *Edinburgh Evening News* (seventeen dials); Academical Club, Glasgow; Newton Abbot Secondary Schools; Oxford County Asylum.

## APPOINTMENTS AND PERSONAL NOTES

The Rumford medal of the American Academy of Arts and Sciences has been awarded to Dr. W. D. Coolidge, Assistant Director of the research laboratory to the General Electric Co. (Schenectady), for his work on the tungsten lamp and his Röntgen ray tube with tungsten electrodes.

The Manchester Electricity Committee has appointed Mr. H. W. Saunders as Draughtsman, at a salary of £225 per annum.

The Wigan Corporation has decided that Mr. J. Slevin, at present Borough Electrical Engineer and Tramways Manager, shall devote his whole time to the electricity undertaking, and that his salary in future will be £400 per annum, with house, coal, and light.

Mr. H. V. Schofield, of the Newcastle & District Electric Lighting Co., has been appointed Battery Inspector with the Chloride Electrical Storage Co.

We are glad to report that Mr. Edgar Barralet, of Pinchin, Johnson & Co., is now quite out of danger, and is progressing rapidly towards recovery.

The following increases in salary in the Brighton Electricity Department have been sanctioned: Mr. G. Cloughton, Assistant Engineer, from £350 to £375, rising to £400 at the end of twelve months; and Mr. T. Henwood, Mains Engineer, from £205 to £220, rising to £250 at the end of twelve months. A proposal to increase the salary of Mr. G. T. Joyce, Assistant Manager, from £300 to £325 was defeated. It fell to Alderman Gervis to recommend and support these proposals, and in this connection reference may be made to his comments at the I.M.E.A. meeting this year as to the difficulty of inducing the Brighton Town Council to recognise brains adequately.

Mr. L. C. Budd, of the Engineering Staff of the Botulander Automatic Telephone Co., was drowned whilst bathing at Kingston last Saturday.

The late Mr. James Howden, Chairman of Messrs. James Howden & Co., of Glasgow, left personal estate valued at £388,252.

**"Freezor" Fans.**—We hear from the General Electric Co., Ltd. (67 Queen Victoria Street), that owing to large reserve stock that they carry of electric fans of their own manufacture, they are still able to give certain and rapid delivery, in spite of the fact that over 1,200 fans were supplied by them between June 29th and July 4th.

## LOCAL NOTES

**London: Hackney: Bulk Supply.**—A proposal has been made by the Metropolitan Boroughs' Standing Joint Committee that a special meeting, consisting of representatives of the Metropolitan Borough Councils owning electricity undertakings, should consider and report upon the desirability of those Councils taking immediate steps for the joint provision of a bulk supply of electricity. The Hackney Council has been invited to appoint three representatives, but the Electricity Committee reports that it does not think any good purpose will be served by the appointment of the proposed meeting, and recommends that no action be taken in the matter.

**Hampstead: Electric Lighting Profits.**—The net surplus on the electricity undertaking for last year was £6,257, of which £2,162, equal to a rate of 1d. in the £, has been transferred to relief of rates. After making additions to reserve, the balance of £3,871 is carried forward.

**L.C.C.: Bulk Supply Agreement.**—The Council has intimated to the Board of Trade that it has no observations to make with regard to an agreement for bulk supply between the Woolwich Borough Council, the South Metropolitan Electric Light & Power Co., and the West Kent Electric Co. With regard to the agreements between the Stepney and Bethnal Green Councils for a bulk supply, at the suggestion of the Council the Board of Trade has agreed to an alteration to the effect that any dispute as to the accuracy of the meter registering the bulk supply should be referred to the Council.

**Poplar: Electricity Accounts and Loan Periods.**—The net profit for the past year's working was £8,010, as against £3,170 in the previous twelve months. To this has been added the unappropriated balance from the previous year of £2,691. The Committee recommends that £2,433 be appropriated for displaced machinery and various other items, including services and meters, £2,402, wiring installations, £967, and cooking installations, £91, leaving an unappropriated balance of £4,817 to be carried forward. Owing to the agreement between the Poplar and Stepney Councils for mutual bulk supply, it is not anticipated that further plant extensions will be required until 1917. Mr. Horace Bowden, the Borough Electrical Engineer, referring to the recent revision by the L.C.C. of the maximum periods for repayment of loans, viz., land, sixty years, buildings, thirty years, mains, twenty-five years, machinery, fifteen years, services, twelve years, and meters, ten years, said that he has hitherto advocated a policy of borrowing only for periods of twenty years and over. The action of the L.C.C. is, he considers, most drastic, and places severe restrictions upon expansion of business. The working costs are 0.55d. per unit, and constitute a record for the Metropolitan area.

**Newcastle-under-Lyne: Supply to Small Houses.**—Mr. A. J. C. de Renzi, the Borough Electrical Engineer, is preparing a scheme for the wiring of small houses at a cost of from £5 to £10 each according to size, the idea being to work in conjunction with contractors, and for the consumers to enter into hire-purchase agreements.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday, night was £63 10s. to £64. (Last week, £62 5s. to £62 16s.)

**Works Holidays.**—T. W. Broadbent, Ltd. (Victoria Electrical Works, Huddersfield), inform us that their works will be closed from Friday night, July 24th, to Tuesday morning, August 4th.

The works of the Record Electrical Co., Ltd., will be closed from Friday evening, July 31st, till Monday morning, August 10th.

**Reduction in Prices of Wires and Cables.**—The India-rubber, Gutta-percha & Telegraph Works Co., Ltd. (106 Cannon Street, E.C.), announce reductions in the prices of some of their rubber-insulated wires and cables. Their discounts on 2,500, 600, and 300 megohm 600-volt C.M.A. and Association pure india-rubber flexibles are now 33½, 15, and 10 per cent. respectively. Reductions are also announced by Siemens Bros. & Co., Ltd. (Woolwich).

**The New Ediswan Showrooms.**—The trade entrance of the new showrooms of the Edison & Swan United Electric Light Co., Ltd., at 123-125 Queen Victoria Street, is at 228-229 Upper Thames Street, E.C.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**General Electric Co.**—Mr. H. Hirst, presiding at the annual meeting on Friday, called attention to the very satisfactory result of the past year's trading, viz., a net profit of £157,893, against £145,260 in the previous twelve months. After adding the balance brought forward there was a total of £190,224 to be distributed. Of this £8,000 is absorbed by debenture interest, and £24,328 in depreciation. The directors have put aside the same generous amount as in past years, but the state of the books permits the use of £10,000 for removal expenses in connection with the Kingsway building. In addition a sum of £10,156 has been provided for managing directors' and employees' bonus, and £14,000 towards writing off the expenses of the new issue of capital, and a carry forward of £36,739 remains after paying 10 per cent. on the ordinary shares. Special attention was called to the fact that the reserve fund now equals the whole of the debenture issue. Mr. Hirst emphasised the point that whereas the Company was to a large extent identified with the small electric supplies business, it was a fact that the progressive results of the past year's trading had been principally due to the expansion of the engineering and other departments. It was true, he said, that the growing demand for domestic electrical apparatus claimed a considerable part of the Company's capital and attention, but it was too little realised that the G.E.C. is in the front rank of those supplying the world with large electrical machinery. Already the Company had produced machines up to 6,000 kw., and hoped to go still further. The latest important development was the establishment of a cable works at Southampton in conjunction with Messrs. Pirelli, both companies subscribing 50 per cent. each of the £200,000 capital. These works are now completed, and it was hoped within a few months to supply cable and wire from these works at a price that would compare favourably with that of any other firm. No questions were asked by the shareholders, and the report and accounts were adopted.

**Edmundsons' Electricity Corporation.**—The report for last year shows that the Company continues to make steady progress. The gross trading profit increased by £912, and dividends and interest increased by £1,640. The loss on working local authorities' undertakings is reduced by £136. The net profit, after providing for debenture interest and redemption, is £23,125, an increase of £4,225. After carrying £9,000 to reserve, the final dividend on the cumulative preference shares absorbs £6,000, and the balance is carried forward.

**Crompton & Co.**—The first accounts of the reconstructed company show an available balance of £13,550, after meeting depreciation and debenture interest. The sum of £2,500 is to be placed to reserve, £1,500 is to be written off preliminary expenses, the 5 per cent. preference dividend absorbs £4,391, and the balance of £2,189 is carried forward. The directors report that the reconstruction of the company has had a beneficial effect on the business, all departments of the company are fully employed, and the outlook for the current year is promising.

**Consolidated Diesel Engine Manufacturers.**—An order for the compulsory winding up of this company was made in the Chancery Division by Mr. Justice Astbury on Tuesday.

**Compulsory Tungsten Filament Lamp License.**—Before Mr. Justice Warrington, on Monday, the Robin Electric Lamp Co., Ltd., applied for particulars of the grounds of opposition of the British Thomson-Houston Co. and Siemens Bros. & Co. to a petition for a grant of a compulsory license to manufacture metal filament lamps under the tungsten lamp patents. Mr. Cave, K.C., said that so far all the companies manufacturing these lamps, with the exception of the B.T.H. Co., had declined to give the Robin Co. a supply of tungsten. The B.T.H. Co. had offered to supply wire at 125s. per thousand feet, which was unreasonable, as it could be bought abroad at 40s. per thousand feet. The companies opposing the application for a compulsory license said that the requirements of the public were already satisfied, and that sufficient licenses had already been granted. Mr. A. J. Walter, K.C., and Mr. H. A. Colefax, K.C., on behalf of the B.T.H. Co. and Siemens Bros. & Co., respectively opposed the application for particulars of the grounds of opposition, and urged that the patentees ought not to be compelled to disclose private trade transactions and bargains with their licensees.

**I.M.E.A. Bill.**—This Bill was introduced into the House of Commons by Sir William Howell Davies last week, and read a first time. We gave a summary of its contents in our issue for March 5th, p. 127.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 394 [VOL. X., No. 29]

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THURSDAY, JULY 16, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLE FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, Tuesday first post.

Small Advertisements and Official Announcements, Wednesday first post.

Displayed Advertisements, Tuesday first post.

Corrections in Standing Advertisements, Monday first post.

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE electrical section of the British Standards Committee has been reorganised, and its committee is now the same as the British Committee of the International Electrotechnical Commission. A large number of sub-committees have been formed. Among the subjects now being worked on are electrical machinery, meters, ceiling roses, plugs and sockets, cables and lamps. (Page 406.)

SEVERAL matters of importance in relation to electricity supply in London are reported. The City of London Corporation does not propose to give notice to purchase the City of London and Charing Cross Companies undertakings; a Special Committee of Metropolitan Borough Councils is to investigate the question of bulk supply, and the L.C.C. has refused to convene a conference with the Borough Councils on the question of periods of repayment of loans. (Page 406.)

THE Annual Report of the Chief Inspector of Factories includes the Report of Mr. G. S. Ram, the Electrical Inspector, who reports a slight increase in accidents from electrical causes but a decrease in the fatalities as compared with last year. An increase is reported in lead-poisoning in accumulator factories. (Page 407.)

A RESEARCH is in progress at the National Physical Laboratory on the heating of buried cables. This is being done at the request of the Research Committee of the Institution of Electrical Engineers. (Page 407.)

QUESTIONS relating to electrolytic lighting arrester and to the running of a three-phase motor are propounded in our Questions and Answers columns. (Page 408.)

THE work of the International Commission for Wire-

less Telegraph Research is now in full swing.—Sir Ernest Shackleton has appealed for funds for a wireless telegraph equipment for his Antarctic expedition.—The hearing of the Marconi v. Helsby wireless patent case was concluded on Tuesday last. Judgment was reserved.—The use of automatic telephone exchanges is to be extended by the Post Office. (Page 408.)

THE question of whether motor-omnibuses shall contribute directly to road maintenance is to be dealt with by a Departmental Committee. (Page 409.)

THE specification relating to the Ferranti-Waters' reverse power relay was amongst those published last week.—Patents for the treatment of magnetic steel and for the manufacture of ductile tungsten have been granted to the B.T.H. Co. and C. Trenzen respectively, notwithstanding the opposition raised.—A patent for a simple construction of field-magnet windings expires this week after a full life. (Page 410.)

OUR Trade Section contains a description of a new switch and illustrates installations of half-watt lamps. (Page 411.)

EXTENSIONS are contemplated at Manchester (£68,000); Burton-on-Trent (£7,000); Redditch (£18,000); Dublin (£82,000); East London (S.A.) (£775); and Oldham (£40,000).—A cooling tower is required at Aldershot; battery, booster and switchgear at Grimsby; flame arc lamps, etc., at Salford; meters and motors at Ashton-under-Lyne; cable at Turton; and sub-station switchgear at Manchester. (Page 413.)

A PROPOSAL to meet the cost of two cooling towers out of the reserve fund at Sheffield has met with considerable opposition.—A L.G.B. inspector severely criticised last week the action of the Manchester Corporation in paying large sums out of electricity profits for relief of rates, and immediately coming for borrowing powers for such things as motors.—The turbo-generator which broke down at the L.C.C. power station early in the year has cost £1,615 to repair.—A proposal for bulk supply has been submitted to the Dover Corporation by the South-East Kent Electric Power Co. (Page 414.)

**Switchgear Tenders.**—We have received a copy of a letter which has been addressed to the Secretary of the I.M.E.A. by the B.E.A.M.A., calling attention to the difficulty and expense which contractors are asked to incur in tendering for switchgear, with particular reference to a recent case at Dundalk, where the prices had to be split up into separate items. It will be remembered that the subject was dealt with in a letter published in ELECTRICAL ENGINEERING, October 31st, 1912, when attention was drawn to the enormous number of unnecessary drawings which switchboard contractors and sub-contractors were often called upon to make. The Secretary of the I.M.E.A. has replied that, although an opportunity will not arise for some time for the Council to consider the matter, he feels sure that they sympathise with the expressions contained in the letter, and points out that they have, in fact, already expressed their views in this connection.



## THE ENGINEERING STANDARDS COMMITTEE

IN consultation with the Institution of Electrical Engineers, the Electrical Section of the Engineering Standards Committee has lately been reorganised. The Institution is now represented on the Main Committee by Col. R. E. Crompton, Sir John Snell, and Mr. C. P. Sparks, and the new Sectional Electrical Committee is the British Committee of the International Electrotechnical Commission. This Committee is now constituted as follows. (The bodies represented by individual members are given in brackets.) :—

Sir John Snell, *Chairman* (Crown Agents for the Colonies); Messrs. A. Siemens and C. P. Sparks, *Vice-Chairmen*; Mr. C. H. Wordingham (Admiralty); Capt. G. L. Hall (War Office); Mr. M. G. Simpson (India Office); Mr. G. S. Ram (Home Office); Mr. W. Slingo (Post Office); Mr. H. A. McFerran (Office of Works); Dr. R. T. Glazebrook (National Physical Laboratory); Messrs. W. Duddell, F. Gill, R. Hammond, J. S. Highfield, and R. T. Smith (I.E.E.); Messrs. A. C. Cramb and A. H. Seabrook (I.M.E.A.); Messrs. C. Koettgen, P. A. Lange, and A. P. Wood (B.E.A.M.A.); Mr. W. R. Rawlings (Electrical Contractors' Association); Mr. E. T. Ruthven-Murray (Incorporated Association of Electrical Power Companies); Mr. S. Sellon (Tramways & Lt. Rlys. Assoc.); Col. R. E. Crompton, Sir John Gavey, Mr. W. Judd, Dr. Gisbert Kapp, Prof. T. Mather, Mr. C. H. Merz, Mr. H. W. Miller, Dr. A. Russell, Capt. H. R. Sankey, Dr. S. P. Thompson, Mr. A. P. Trotter, and Mr. P. F. Rowell, *Hon. Sec.* A representative of the L.C.C. has yet to be nominated. Mr. A. Siemens takes the chair when questions affecting the I.E.C. are discussed.

The following are the chairmen of sub-committees :—Dr. Glazebrook (Standardisation of Electrical Machinery, Physical Standards, and Lamps); C. P. Sparks (Power Cables); Mr. C. H. Wordingham (Electrical Accessories); Sir John Gavey (Telegraphs and Telephones); Capt. H. R. Sankey (Prime Movers); Mr. A. P. Trotter (Nomenclature); Dr. A. Russell (Symbols). There will also be "Panels" on Rating of Electrical Machinery presided over by Dr. Glazebrook, and on meters, plugs, switches, fuses, heating and cooking apparatus, carbon brushes, control gear, and electric vehicle accessories, presided over by Mr. C. H. Wordingham.

The British Committee has nominated the following delegates to the Special International Committees of the I.E.C. :—Nomenclature, Dr. S. P. Thompson; Prime Movers, Mr. Gerald Stoney; Rating, Dr. Gisbert Kapp; and Symbols, Dr. A. Russell. Mr. A. R. Everest (B.E.A.M.A.) has again been appointed as counsel to the British delegate on Rating.

The work at present in hand consists both of revision and new work. A preliminary draft of the British Standardisation Rules for Electrical Machinery is being drawn up in co-operation with the Revision Committee of the American Standardisation Rules. The specification for electric meters is also under revision, and a specification for two- and three-plate ceiling roses will be published almost immediately, as well as a report on the specifying of the resistance of steel conductor rails. Progress is also being made in regard to the standardisation of two-pin plug and socket devices, a specification for which should be ready in the autumn. Through the assistance of the B.E.A.M.A. it is also hoped that considerable progress may be made in regard to the standardisation of a number of other accessories. In this connection, the Committee is co-operating with the Electric Vehicle Committee of the I.M.E.A. The report on cables is to be revised and extended, and the work upon a revised specification of carbon and metal-filament lamps is to be continued. The question of tungsten filament electric lamps for automobiles is also being considered at the request of the Society of Motor Manufacturers and Traders, by a Sub-Committee under the Chairmanship of Col. H. C. L. Holden.

### Gas Co.'s Action against the Ilford Electricity Department.

—In connection with our comment on this subject in our last issue, Mr. H. Faraday Proctor, Hon. Sec. of the Incorporated Municipal Electrical Association, writes us that he had already taken up this matter some time ago, and has had considerable correspondence both with the Clerk to the Long Eaton U.D.C. and also, more recently, with Ilford. We are glad to see that the I.M.E.A. is proposing to act officially in the matter, and we trust that it will be somewhat on the lines indicated in our last issue, viz., that a clear definition of what is and what is not preferential charging should be arrived at, and that the I.M.E.A. should be prepared to support this definition to its utmost ability. On the other hand, the question of hiring powers for motors cannot be settled, except by the obvious method that those Corporations who do not possess hiring powers and who wish to hire out motors should obtain them.

## FUTURE OF LONDON'S ELECTRICITY SUPPLY

THE Borough Councils in London are apparently not satisfied to leave matters at a standstill whilst the London County Council is deciding what steps to take in connection with Messrs. Merz and McLellan's report on the future of London's electricity supply. We reported in our last issue that the Metropolitan Boroughs' Standing Joint Committee proposed to appoint a Special Committee to consider and report upon the desirability of the Metropolitan Boroughs owning electricity works taking immediate steps for the joint provision of a bulk supply of electricity. Although, as we stated last week, the Hackney Council did not agree with the proposition, nevertheless this Special Committee has been formed, and presumably will get to work immediately.

As there has been considerable reluctance on the part of the L.C.C. in some cases to grant sanction for loans for extensions of Metropolitan Borough electrical undertakings which are obviously required to meet the statutory obligations on account of increasing demands, the L.C.C. has been asked to call a conference of such Councils with a view to discussing the whole of the question of repayment of loans. The matter was referred to in a "Local Note" last week dealing with the Poplar accounts, but the request has been refused on the ground that the matter would be more appropriately dealt with by a deputation to the Council. The Clerk to the Poplar Council has now written expressing the deep regret and keen disappointment of that body that the L.C.C. has once more refused to recommend the convening of a conference, and at the same time strongly deprecates the L.C.C.'s action in view of the importance of the matter.

When the recommendation of the Committee was brought before the Council on Tuesday, Mr. H. H. Gordon moved its rejection, and urged the necessity for calling a conference. This was supported by another progressive member of the Council, but the Chairman of the Finance Committee said that only two or three weeks ago the Council, by a non-party vote, decided to offer to convene a conference to deal generally with the question of electric supply, but excluding the question of the periods for the repayment of loans, as in this matter the County Council exercised a statutory discretion. This offer, however, has been declined by the Borough Councils. The rejection of the report was negatived by 51 votes to 30.

The position of electricity supply in the City has also been receiving attention during the last few days, so far as the possible purchase of the City of London and Charing Cross Cos.' undertakings in the city are concerned. In 1912 the City Corporation obtained the opinion of the late Mr. W. C. Danckwerts, K.C., who expressed the view that the City Corporation could purchase the undertakings of the Companies by giving them six months' notice on August 18th, 1914, or August 18th, 1924. The City of London Co., on the other hand, have taken the advice of Sir Robert Finlay, K.C., Mr. George Cave, K.C., and Mr. Tyldesley Jones, whose opinions differ from those of the late Mr. Danckwerts. Their view is that the Corporation will have no right to purchase the undertaking of the City Co. if it does not give notice as from August 18th. The Streets Committee of the Corporation, however, recommended at the meeting on Thursday that it would be inexpedient to exercise the powers to purchase in 1914-15. There was no discussion upon this report.

**University College, London.**—In the Faculty of Engineering, the following awards have been made :—Chadwick Medal and Prize, J. A. Parker; Andrews Scholarship (2nd year), J. Mould; Goldsmid Scholarship (2nd year), H. P. Gardham; (3rd year), P. L. Capper; Archibald P. Head Medal and Prize, Z. S. Quai. Engineering Diplomas :—A. Arias (Electrical), G. G. Dawson (Electrical), W. J. Duncan (Mechanical), C. C. R. Edwards (Mechanical), G. H. Elliot (Civil), G. V. P. Filsell (Civil and Municipal), A. E. Griffin (Civil and Municipal), Z. S. Quai (Civil and Municipal), P. W. Miller (Civil and Municipal), A. Mylting (Civil and Municipal), J. A. Parker (Civil and Municipal), J. R. Pigott (Mechanical), F. Procter (Civil and Municipal), D. M. Rowland (Civil and Municipal), P. Schur (Civil and Municipal), D. G. Trouton (Electrical), and W. J. Wells (Civil and Municipal).

**The West Ham Electricity Works.**—A special summer issue of the West Ham Corporation Electric Service half-yearly bulletin contains an illustrated description of the generating station at Canning Town, including the large extensions recently completed. These extensions were described in *ELECTRICAL ENGINEERING*, Vol. IX., June 12th, 1913, page 339, and contain several points of special interest, including the suction plant for ash disposal, the turbo-generators, and the very compact coal-handling plant. Notes on the sales department and on the special arrangements for charging electric vehicles.

## ELECTRICITY IN FACTORIES AND WORKSHOPS

THE Annual Report of the Chief Inspector of Factories and Workshops for 1913 contains in its various sections several references to electrical matters, including the report of Mr. G. Scott Ram, the Electrical Inspector. The Divisional Report states that the increased use of electricity as a motive power is not less remarkable than in previous years, and is noticeable in all parts of the country; it is specially commented upon in Scotland, where the strenuous efforts made by the Town Councils to get traders to adopt this form of power have resulted in many small joiners, tailors, watchmakers, bootmakers, and others putting in electric motors, even in places where only two or three hands are employed.

Mr. Ram's Report records 392 non-electrical (including seven fatalities) and sixty-five electrical accidents (two of them fatal) at public supply stations, and forty-seven non-electrical and twenty-nine electrical accidents (only one of the latter fatal) at other stations. The non-electrical accidents show an increase of 18 per cent. over the previous year, and were such as are liable to occur in engineering works generally. The electrical accidents, writes Mr. Ram, are remarkably few in view of the large number of stations. The total is greater than last year, but the fatalities less. Forty-six per cent. of them were due to working on live switchboards, and a large proportion were of a clearly preventable nature. In this class are two fatalities on medium-pressure circuits. The only other electrical fatality was to a man working inside a boiler who was provided with a faulty hand-lamp.

The electrical accidents reported at factories other than generating stations were 418 in number (against 283 for the previous year), of which seventeen were fatal (against fifteen for the previous year). They are classified as follows: Arcing of switches, 56; arcing of fuses, 17; shock or burns when replacing fuse wires, 35 (one fatal); portable apparatus, 66 (three fatal); unprotected conductors, 42 (five fatal); working on or near live conductors, skilled persons 42 (three fatal), unskilled persons, 43 (two fatal); miscellaneous in manufacturing and repair works, mostly in testing, 66 (one fatal); brushes and commutators, 10; miscellaneous, 41 (two fatal). The increase over the previous year is hardly surprising, in view of the enormous extension in the use of electrical energy. A large number of the accidents are reported as having been due to inadequate skilled supervision, both as regards initial selection and installation of the plant and its subsequent working and maintenance; this is particularly so in those due to arcing of switches and fuses. The three fatalities in connection with portable apparatus were all due to the use of hand-lamps of obsolete type, with the lamp-holder in connection with the other metal-work which was not earthed. There were several narrow escapes in hand-lamp accidents; in one case the connections of an auto-transformer were such that although there was only 110 volts across the lamp, the pressure to earth was the full 440 volts. The majority of the accidents in the use of portable apparatus occur in the handling of the connectors and flexible conductors. One of the fatalities in the next class was due to non-earthing of the guide wires and winch of the lowering gear of an arc lamp; several of these accidents also occurred on electric cranes. Most of the accidents to "skilled" persons working on live conductors need not have occurred, "the persons concerned being acquainted with the dangers, having often only themselves to blame for not taking proper precautions. The corresponding accidents to unskilled persons," continues the Report, "differ in this respect. The victims, having little or no knowledge of the dangers, are put to work, or are permitted to work, under dangerous conditions without proper precautions or supervision by competent persons in authority over them. In most cases there could have been no necessity for the work to be undertaken whilst the conductors were 'live.' The number of accidents in electrical manufacturing works has more than doubled. This is no doubt generally an indication of increased activity in manufacturing, leading to pressure of work in the testing departments of the works concerned. The fatal accident occurred in the testing department of a cable works, and was primarily due to a mistake in switching. Amongst the miscellaneous accidents, one was due to an old form of practical joke—a live wire being attached to a door-handle. A similar joke a year or two ago had fatal consequences. In the present case the victim received a serious shock, but recovered. In the two fatal cases death was due to fall."

Mr. Ram reports that in his visits to works during the year he found numerous examples of dangerous conditions both in old and new installations, and in many cases regards it as

purely a matter of good fortune that accidents had not occurred. In a number of cases he found passage-ways in which bare conductors were exposed all along the side without any protection. Some high-tension gear was constructed without any provision for screening off adjacent live conductors while work was in progress. Oil-switches, for example, were placed close to bare bus-bars in such a way that although they would be disconnected by isolating switches, the live conductors could not be screened. In one station the oil-switches could not be made dead without interrupting the supply. Several cases were found where new switchboards were erected, having less than the required space at the back, a mistake for which there is obviously no excuse. A number of 440-volt three-phase switchboards were found having iron plating for the working platform, and no "insulating stands." A large number of distribution fuse-boards for power circuits were found having fuses which could not be handled without risk of touching live metal, and many for lighting circuits having the additional defect that the hand is liable to be burned by the blowing of the fuse. One extensive power and lighting installation, 440-volts three-phase, put up by a foreign firm of contractors, was dangerous in almost every conceivable way. There was bare switchgear over iron floors, and some out-of-doors, bare conductors within reach. There was no means of cutting off the pressure from the power circuits except by shutting everything down at the main switch in the sub-station some distance away, and for the lighting circuits the main switch did not cut off the pressure. The lighting was taken from a fourth neutral wire, and one or other of the phase wires. The main switch did not break on the neutral conductor, and this was not earthed, so that it was liable to be live at 250 volts above earth, even with the main switch off. It would appear that competition and consequent cutting of prices was often responsible for work not being in accordance with the requirements.

In the Divisional Report, the question of the temperature and ventilation of incandescent lamp factories is referred to, and a case where the temperature is successfully kept down by a continual supply of cool, fresh air in a lampworks in the Midlands is referred to. In the South-Eastern District the matter of ventilation of lampworks has been specially under observation, and the results were most satisfactory.

In dealing with dangerous trades, the increasing manufacture of accumulators, particularly in connection with the motor-car trade, is mentioned, and the success of localised ventilation to the benches to combat lead-poisoning is referred to. The medical inspectors, however, report an increase in poisoning cases from this cause, and urge the necessity of further adoption of these precautions. Two cases of mercurial poisoning are also reported in the manufacture of electricity meters and mercury vapour lamps respectively.

## THE HEATING OF BURIED CABLES

THE Research Committee of the Institution of Electrical Engineers recently appointed a sub-committee to consider the question of the heating of buried cables, and subsequently decided to make a grant in aid of a research on the subject. A summary of the present knowledge in this direction has been prepared by Messrs. S. W. Melsom and H. C. Booth, of the National Physical Laboratory, and is published together with some other notes on the progress of the research in the Journal of the Institution. This goes into the matter theoretically, reviewing the formulae of Kenelly, Teichmüller, Abt, and others, and summarises experimental work and deductions of a number of workers and their bearing on the rules drawn up by a Commission of the Verband Deutscher Electrotechniker. From this it appears that while the constants for armoured cables laid direct in the ground are fairly well known, there is little information cables drawn into conduits or laid solid in bitumen. The German tables for armoured cables, however, probably represent rather different conditions from those obtaining here. There is also some doubt as to the certain assumptions made in the formulae. The matter is much complicated by the varying conditions of the soil and method of laying, and preliminary experiments show results differing by as much as 100 per cent. Although there has been much preparation; the main experimental work was not yet commenced at the time of the report. The research will be divided into two parts. The first will consist of a series of tests on lengths of cable laid on various systems in the grounds of the National Physical Laboratory, and the second part of tests on actual mains under as nearly as possible actual conditions. The principal points to which the research will be directed are to obtain definite information as to the temperature of and the moisture in the soil, the determination

of the thermal constants of the soil, of the cable coverings, and of the various ducts. The heating of cables when laid (a) direct in the ground, (b) solid in bitumen, and (c) drawn into ducts, the external thermal conditions being the same. The temperature attained by mains in actual service and the load-factor of the cables. The determination of the watts lost in different types of cable with alternating current.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,400.

In connection with aluminium electrolytic lightning arresters, what is the electrolyte (giving a critical A.C. voltage of about 300) that is generally used? Is it true that only one wave of the alternating current produces the insulating film by converting the aluminium in hydroxide, while the opposite wave has no effect. Also, is it necessary to form the film or even part of it before assembling the aluminium trays?—"ARRESTER."

(Replies must be received not later than first post, July 23rd.)

### QUESTION No. 1,398.

A three-phase slip-ring motor generator, 400 h.p. 2,200 volts, is loaded about 35 per cent., and is supplied from a distant power station  $2\frac{1}{2}$  miles away, through aluminium lines 37/12 S.W.G. The motor runs satisfactorily until another motor of 300 h.p. is switched in circuit, when a heavy thump is heard shaking the foundation and breaking the bridge connections of rotor winding each time the second motor is switched in; this machine is controlled with reversing switch, and is 500 yds. further away. The thump is not heard in the motor when switching on the motor-generator. The starting current of the motor is about 50 amps. at 2,200 volts.

Can I do anything to prevent this heavy thump?—"DEAD EARTH."

As no replies have been received, the time for answering this question has been extended till July 23rd.

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will lighten your costs very considerably.

They leave the dies in a finished, ready-

for-use state, accurate to a degree only obtainable (by other methods) by long and costly "micro-machining." In addition to this each one is an exact duplicate of all the others—and so all die cast parts are automatically interchangeable, but they must be "Prana."

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## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The International Commission for Radio-Telegraphic Research, which was inaugurated at a meeting in Brussels in April last, has held a further meeting, at which its constitution has been adopted in definite form. Mr. W. Duddell is President, Prof. Wien, Vice-President, Dr. R. Goldschmidt, General Secretary, and Mr. R. Brailard, Assistant Secretary. National Committees have been formed in Belgium, France, and Great Britain. A large number of technical matters were brought up at the meeting. Dr. Goldschmidt described the latest improvements at the Laeken station, and it was decided that a small high-frequency alternator be acquired. Reports were also read by Prof. Schmidt (Halle) on observations by a barometer and galvanometer by Messrs. Vollmer and Wien (Jena), Dr. Marchant (Liverpool), Mr. Lucas (Namur), and Mr. Wulf (Volkenburg), on photographic registration of signals, by Mr. Bonndorf (Graz) on reception of signals from Brussels at a distance of 2,000 km. by a detector and galvanometer, and by Prof. Howe (London) on the determination of the energy received from Brussels and Paris. In the discussion on these the Commission expressed the wish that experimenters would send in with their results characteristics of their antennae, and that wherever possible should employ photographic registration. Mr. Duddell also read a Paper on methods to be employed, and suggested the employment of a closed receiving circuit at the control station similar to that used by Mr. Braun (Strassburg). Communications were also read by Mr. Abraham (Paris) on measurements of the velocity of propagation of waves between Paris and Washington by his narrow coil galvanometer; by Mr. Vollmer on the non-constancy of crystal detectors; by Prof. Wien on the thermal inertia of thermo-elements, and by Mr. Drumeaux (Brussels) on amplification and production of waves oscillation by "von Lieben" valves. Arising out of this communication Prof. Wien described a method of quickly determining resonance curves of the von Lieben tube in order to obtain antenna constants. Dr. Eccles read a report on the steps taken by the B.A. Committee regarding the solar eclipse of August 21st, and a special committee, consisting of Messrs. Bonndorf, Eccles, Ferrié, and Wien, was nominated to consider the matter.

The success of Dr. Mawson's wireless telegraph equipment, by means of which his base on the Antarctic Continent was kept in touch with the rest of the world through his other station at Macquarie Island, directed a good deal of attention to the possibilities of wireless communication for Polar exploration work, and it is to be hoped that the desired funds will be forthcoming so that Sir Ernest Shackleton's Antarctic expedition can be provided with all they want in this direction. There is also much experimental work of interest that could be done if his party were able to establish fairly powerful stations at the two proposed bases—one on each side of the Continent. First of all, there is some question as to whether communication could be maintained at all between them, owing to the height of the mountain ranges intervening and the probable high degree of ionisation of the air in polar regions, apart from the difficulties of maintaining high aerials in the violent winds that are experienced. There are many problems regarding the effect on wireless transmission of the extreme climatic and meteorological conditions that might be studied. It is to be hoped, too, that it will be found possible to devise a satisfactory sledging set within a practicable weight limit, but a good deal of experimenting will probably be required as to a suitable form of aerial and earth connection or its equivalent. Possibly when on the high ground near the Pole, aerials of quite small size will be found sufficient. It will be remembered that Amundsen is equipping the *Fram* with a wireless installation for his North Pole expedition, and is also providing some form of portable sledge outfit. Telephones have already been used with success for base work. Capt. Scott's main base was connected by a line fifteen miles to Hut Point, and other short lines were in constant use for meteorological and astronomical work. In these cases bare aluminium wires resting on the snow were used for the lines. If such an arrangement could take the place of raised aerials for the wireless work, the problem would be much simplified.

The Bradford Corporation has decided to call a conference of Corporations in the West Riding of Yorkshire to consider a scheme under which the control of the telephone service in this area shall be under municipal control.

In an article in the *Nineteenth Century and After*, entitled "An Inter-Imperial Cable Link," Mr. Charles Bright, F.R.S.E., deplores the passing of the control of the Atlantic cables into American hands, and the transfer of the Government landing licences, and puts in a strong plea for a British State-controlled Atlantic cable to act as a connecting-link with the Pacific cable. He discusses a proposed route for such a cable, and dwells on the strategic and political aspects of the question, and easily disposes of financial difficulties. The same subject was dealt with by Mr. Bright from a slightly different point of view in a Paper read recently before the Royal Society of Arts on "The Administration of Imperial Telegraphs," in which he advocated centralised Government control of inter-Imperial communication, and pressed for a Royal Commission to study the subject. A certain amount of divergence of opinion was voiced in the discussion, and in a written communication Major W. A. J. O'Meara (late Engineer-in-Chief to the Post Office) expressed his conviction that State management of so highly technical a service as submarine telegraphy would defeat the very object that Mr. Bright had in view.

The report of Marconi's Wireless Telegraph Co. for the past year, although recommending final dividends making 17 per cent. on the preference shares and 20 per cent. on the ordinary shares for the year, shows a considerable decrease in the net profits, viz., from £413,294 to £122,323. This is largely accounted for by unremunerative expenditure in connection with the Imperial wireless telegraph scheme, whilst the Directors also reminded the shareholders that the substantial profits made for 1912 were realised under exceptional circumstances. The Trans-Oceanic Wireless Telegraph Co., which was registered last year, has taken over the new stations in Wales for the purpose of conducting a wireless telegraph service between this country and the United States. It is anticipated that when this service gets into working order a speed of 100 words per minute will be automatically maintained. The report adds that rapid progress has been made in the development of wireless telephone apparatus, and that the Company has recently introduced a practical and commercial set for moderate distances.

In reply to a question in the House of Commons last week, the Postmaster-General stated that the experimental automatic equipment at Epsom has proved fairly satisfactory. Arrangements have been made to apply automatic systems to the districts of Accrington (700 lines), Darlington (800 lines), Dudley (500 lines), Grimsby (1,300 lines), Newport (1,800 lines), Paisley (1,100 lines), Portsmouth (5,000 lines), Stockport (950 lines), and Leeds (6,800 lines). The Darlington exchange (on the Western Electric Co.'s system) will be opened in a few weeks' time, and an experimental equipment for sixty-five subscribers is to be installed at Chepstow to test the suitability of automatic apparatus for very small exchanges.

On Monday, July 13th, the hearing of the Marconi v. Helsby wireless telegraph patent case was continued before Mr. Justice Eve. Mr. Jaffé, in his speech for the defendants, touched upon the several points which had been mentioned in the course of the proceedings, laying particular stress upon the finding of Mr. Justice Parker in the previous case that Marconi's invention was for a persistently oscillating circuit coupled to a good radiator, so that the former acts as a reservoir for the latter. The defendants' apparatus, he submitted, had not a persistently oscillating primary circuit. On the contrary, the aerial circuit, owing to its comparatively large capacity, was the persistent oscillator. The advantages of this as compared to the Marconi arrangement were, he said, improved selectivity between the sending and receiving stations, and less waste of energy. Dealing with the plea of invalidity, counsel pointed out that the documents upon which the defendants relied had not been cited in the previous case before Mr. Justice Parker. He recalled the evidence of Mr. Swinburne to the effect that once Marconi knew what he wanted, he probably could have made use of Tesla's apparatus for his purpose. The discovery of a new use for a known product, he argued, was not patentable.

The speech for the plaintiffs was commenced by Mr. Walter, who, quoting from Marconi's patent No. 7,777/00, gave the claim as for a transmitter for electric wave telegraphy, consisting of a primary circuit coupled inductively to a conductor or capacity and earth. There was no limitation as to the capacity of the aerial. The Helsby apparatus, he contended, was the same as that described in Marconi's specification, except that here were more spark gaps. Dealing with the question of economical working, he referred to the evidence which had been given showing that with the amount of coupling between the primary and secondary circuits which

the defendants used, only a very small percentage of the energy in the primary could pass over into the secondary during the three and a half complete swings which were said to make up the primary spark. Regarding the documents of Tesla and M. Dueret, which were cited as anticipatory, it could not be denied, he said, that these two writers did not teach the world the substance of Marconi's invention. Mr. Hunter Gray, who also spoke for the plaintiffs, in addition to emphasising the points mentioned by Mr. Walter, submitted that even assuming that the defendants' apparatus does give a primary spark with only three and a half swings, whilst Marconi's apparatus yields, say, a fifty-swing spark, the difference was only in degree, and was therefore not essential. His Lordship reserved judgment.

A wireless telephone has been installed at Scranton, Pennsylvania, by which communication with an express train travelling at 60 miles an hour has been established over a distance of 53 miles. The telephone is of the de Forest type, and the antenna of Scranton is 300 ft. long, and has an elevation of 150 ft.; the power required was approximately 1 kilowatt. It is intended to equip two of the fast trains with this apparatus for public use.

According to the *Daily Telegraph*, two engineers of the Marconi Co. have arrived at Bombay in connection with the Indian wireless telegraph station which forms part of the Imperial scheme.

The Ahvaz-Mohammerch landline is again in working order, and the Fao route was restored on the 9th inst.—The cable between Nagasaki and Tamsui was repaired on the same date, and the new route to the Belgian Congo "via Banana" was opened.

## ELECTRIC TRACTION NOTES

The question of whether motor omnibuses shall contribute towards the upkeep of the roads—an important matter in relation to their competition with tramways—has at last reached the point where the Government has promised to take action. A Departmental Committee has been promised to deal with the whole question of whether both motor omnibuses and trolley omnibuses should contribute towards the maintenance of roads. Simultaneously with the announcement of this Committee have been several decisions of Parliamentary committees which will compel motor omnibus companies and also municipalities running omnibuses outside their own areas to contribute towards road maintenance. Chiefly in this connection may be mentioned the new main road which it is proposed to construct to the west of London, where a toll of three-eighths of a penny per bus-mile will have to be paid by the omnibus companies using the road, whilst cases this session in the provinces of municipalities being put under similar conditions where they run omnibuses outside their own areas on the County roads may be cited at Sheffield and Walsall.

The Bradford Corporation Tramways made a net profit last year of £29,500, against £41,900 in the previous twelve months. The sum of £10,000 is carried to relief of rates, and the balance transferred to reserve, which now stands at £73,000.

The poll of ratepayers at Bristol with regard to the purchase of the Tramway Co.'s undertaking resulted in a small majority in favour, and the Ratepayers' Association has passed a resolution to the effect that the result of the poll does not justify the Corporation proceeding with the Bill to purchase the trams. Something like 40,000 ratepayers did not vote.

The local authorities whose districts are served by the Oldham, Ashton, and Hyde Electric Tramways Co. are considering what steps should be taken to acquire the undertaking, the lease of which expires shortly.

There was a net profit of £53,892 from the working of the Glasgow Corporation Tramways last year. The whole of this is to be paid over to the Common Good, as before arriving at this figure £127,204 has been transferred to depreciation fund, and £85,438 to permanent-way renewals fund.

The West Ham Corporation Tramways Department incurred a loss of £14,422 last year, after meeting capital charges. In addition it has been necessary to realise part of the investments to cover the cost of renewals, with the result that the reserve and renewals fund is reduced from £32,740 to £21,177. West Ham forms part of London which has a very considerable motor omnibus service, the unfair competition of which was commented upon several years ago by Mr. H. E. Blain, when he was Manager.



## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published July 9th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

*Names in italics indicate communicators of inventions from abroad.*

11,539/13. **Improved Transformers.** R. ARNO. The specification describes a method of obviating the possibility of leakage through the iron cores from the h.t. windings to the l.t. windings. The respective windings are located on separate cores, which are insulated from one another by thin sheets of mica or other material. To compensate for the increased reluctance, the section of the cores is considerably enlarged at the joints. As an additional safeguard, the cores on the l.t. side may be earthed. Fourteen figures.

13,418/13. **Reverse Power Relay.** E. G. WATERS. A safety relay, chiefly applicable to the protection of A.C. generators connected in parallel and distributing parallel feeders. The relay has two movable current coils and a fixed coil. The motion of one or other of the current coils is started by interaction with the fixed coil, but is continued by the mutual repulsion between the current coils, even if the fixed coil becomes de-energised after the movement has commenced. An article in *ELECTRICAL ENGINEERING*, June 25th, p. 369, gives details as to the method of applying this device. Six figures.

23,478/13. **Signalling System.** G. DEARLE. Either alternating or direct current may be used for the operation of this system. A series of lamps and audible signals is provided at each station, together with a battery or transformer for supplying energy. Each station is also provided with a signalling switch, the stops of which are interconnected in such a way that on moving the switch arm to the first position, all the lamps at the receiving and sending stations are caused to glow dimly. When the arm is moved to the desired signal, the lamp corresponding to this signal is short-circuited at the sending station, so that it ceases to glow, whilst the corresponding lamp and audible signal at the receiving end come into full operation. The sender has thus a positive check that his signal has been properly transmitted. Five figures.

8,185/14. **Loading Duplexed Telephone Lines.** H. B. M. PLEIJEL and A. H. OLSSON. The present practice of loading overhead lines is to employ double coils for each pair of lines. The stray fields produced are undesirable, as they give rise to eddy current losses in the metal casings, and consequent damping. When these lines are duplexed, special duplex loading coils are necessary. The above Specification describes a method of loading, whereby no extra duplex loading coils are required. The double coils for each pair of lines are enclosed in a case made of non-conducting, non-hygroscopic material, such as glass, and the coils are made of a size sufficient to produce a considerable stray field. This stray field is utilised to produce the necessary self-induction for the loading of the duplex line, so that extra loading coils are unnecessary. Owing to the coils being enclosed in non-conducting cases, the eddy current losses due to the stray fields are extremely small. Lightning arresters are fixed in each case. Three figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials.** &c.: SUNDERLAND [Wire rope insulator couplings] 2,790/14; VON KANDO [Insulators] 2,849/14.

**Dynamos, Motors and Transformers:** JOWERS [Motor control] 16,167/13; BRIT. ELECT. TRANSFORMER CO. and CROSBIE HILL [Phase transformer] 19,182/13.

**Electrometallurgy and Electrochemistry:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Composite metals] 19,021/13; RENNERFELT [Furnaces] 24,850/13; LESCURE [Furnace] 3,291/14; SOC. ELECTRO-METALLURGIQUE DE ST. BERON [Furnaces] 3,835/14; A.E.G. [Welding machines] 8,595/14; GES. FÜR ELEKTRO-OSMOSE [Electro-osmotic diaphragm] 9,265/14; ASHCROFT [Manufacture of alkali metals] 10,980/14.

**Heating and Cooking:** BERRY [Heating apparatus] 14,699/13; DE KOK [Water heaters] 16,214/13; SIEMENS SCHUCKERTWERKE GES. [Cooking ranges] 29,714/13.

**Ignition:** JOHNSON [Sparking plugs] 16,078/13; POHL ES FIAT [Ignition apparatus] 20,800/13; R. BOSCH [Interrupter] 10,380/14.

**Incandescent Lamps:** BOARDMAN, BOARDMAN & BOARDMAN [Daylight-effect lamps] 14,760/13; KRUGER [Filaments] 16,066/13.

**Instruments and Meters:** KOLSTER [Decrement meter] 3,478/14; GRISSON [Röntgen ray meter] 8,146/14.

**Storage Batteries:** SVENSKA AKKUMULATOR AKTIEBOLAGET JUNGNER [Electrodes] 38/14.

**Switchgear, Fuses and Fittings:** PEARD [Fuses] 19,104/13; BICKERSTAFF [Switches] 22,798/13.

**Telephony and Telegraphy:** THOMPSON (*Cie. Univ. de Telegraphie et de Telephonie sans Fil*) [Wave-producing apparatus] 14,140/13; AITKEN [Telephone systems] 14,524/13; LONG [Coin freed telephone] 20,126/13; VISCA [Telegraph transmitters] 26,570/13; WESTERN ELECT. Co. (*Woodward*) [Telephone switching apparatus] 28,802/13.

**Traction:** FINDLAY & FINDLAY [Train control] 14,532/13; MUTTON [Railway signals] 14,771/13.

**Miscellaneous:** A.E.G. [Soldering apparatus] 14,518/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, and Transformers:** HEYLAND [Polyphase machinery] 12,282/14; VOIGT & HAEFFNER AKT. GES. [Regulation of A.C. generators] 14,380/14.

**Telephony and Telegraphy:** SIEMENS & HALSKE AKT. GES. [Automatic and semi-automatic telephony] 6,628/14.

**Switchgear, Fuses, and Fittings:** COLAS [Contact apparatus] 14,006/14; HENSELL [Fuses] 14,474/14.

**Miscellaneous:** SIEMENS-SCHUCKERTWERKE GES. [Hand-drilling machines] 14,022/14; HARLÉ ET CIE. [Distant control] 14,461/14.

The following Amended Specification may now be obtained:—

**Storage Batteries:** F. SABLON [Accumulator case] 6,066/13.

### Restoration of Lapsed Patent

4,030/08. **Improved Telegraph Poles.** An order has been made, restoring this Patent to F. H. TIDNAM on July 1st, 1914.

### Opposition to Grant of Patents

25,902/12. **Treatment of Magnetic Steel.** B.T.-H. Co. (*G.E. Co., U.S.A.*).

26,800/12. **Manufacture of Ductile Tungsten.** C. TRENZEN. The grant of these two Patents has been allowed by the Comptroller.

1,862/13. **Earthing Clip.** F. TOWNSON. The grant of this Patent has been allowed by the law officer.

### Amendment

9,426/12. **Interrupters.** J. BIJUR. As a result of extended investigation under Sect. 8, this Specification has been amended by way of disclaimer.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

13,036/00. **Field Windings of Dynamos and Motors.** H. F. JOEL. This invention applies to machines having an even number of field magnet poles. It describes a method of construction by which all the poles can be magnetised to the correct polarity by the use of a single sinuous coil. This coil is wound on a special former, and the frame of the machine is made in two halves, which can be taken apart to allow the coil to be placed in position, so that the winding passes round three sides of each polar extension. In addition to the obvious advantage of simplicity of construction, this method of winding conduces to sparkless commutation. Twenty figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** E. C. R. MARKS (*Soc. Anon. Italiano Gio Ansaldo & Co.*) [Motor control] 6,461/08; M. KALLMANN [Motor control] 6,957/09.

**Dynamos, Motors and Transformers:** SIEMENS BROS. & Co. and C. RIBER and H. IRELAND [Drive for dynamo] 6,877/09.

**Incandescent Lamps:** DEUTSCHE GASGLÜHLICHT AKT. GES. [Filament manufacture] 28,775/06; W. HEINRICH [Tungsten filaments] 7,092/09.

**Instruments and Meters, &c.:** J. H. BOWDEN and A. H. JACKS [Prepayment meter] 7,005/09.

**Switchgear, Fuses, and Fittings:** SIEMENS BROS. & Co. (*Siemens & Halske Akt. Ges.*) [Mercury switches] 6,073/05, 25,962/09; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Electrolyte for lightning arrester] 6,872/09; J. E. LIDDLE [Liquid starters] 21,595/09.

**Telephony and Telegraphy:** SIEMENS BROS. & Co. (*Siemens & Halske Akt. Ges.*) [Printing telegraphs] 6,740/03, 4,813/06; SIEMENS & HALSKE AKT. GES. [System of telegraphy] 6,929/07.

**Traction:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Signalling] 6,985/09.

**Miscellaneous:** G. H. OATWAY [Device for testing fire-alarm apparatus] 5,984/01; J. M. CAGE [Submarine equipment] 7,179/06; T. H. WURMB [Alarm thermometer] 7,127/07; W. J. GILLILAND and J. E. PLANT [Regulator for hot water system] 6,846/08.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 413. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**SPEED COUNTERS.**—A series of five different designs of speed counters are put forward in a new leaflet from the General Electric Co. (67 Queen Victoria Street, E.C.), including convenient hand instruments for pressing against the ends of revolving shafts, and one provided with a friction wheel by which the speed of any surface in feet per minute can be determined.

**ELECTRICAL PLANT.**—A new edition of the General Electric Co.'s Bulletin, entitled "Important Plant," contains many excellent illustrations of the Witton Works and its products, including turbo-generators, large continuous-current dynamos, rolling mill and other motors, alternators, rotary converters, motor installations, switchboards, &c.

**ELECTRICAL SUPPLIES.**—Some G.E.C. leaflets are also to hand, showing the latest patterns of a number of different specialities which are manufactured by the company. One of the illustrations shows the mining type of "Salford" circuit breaker, which is similar in construction to that described in these columns last week. The "D.B." switch and cut-out sets, the "Slick" combined switch and wall plug, and various patterns of lamp-holders adapted to meet the varied needs of present-day practice are also dealt with. A new and very neat type of suspension switch, with the casing composed of non-inflammable imitation ivory, deserves special mention. The Universal grinders and polishing machines, which can be run from any existing electric light circuit, the "Peel Conner" table telephone sets, and the G.E.C. ammeters and voltmeters are sufficiently well known to require no lengthy description.

**SWITCHGEAR, FITTINGS, &c.**—Further additions to the catalogues of the General Electric Co. are the leaflets which we have received, dealing with "Leader" and "Twin Break" switches and fuses. The former type are supplied in teak cases, and are suitable for circuits up to 250 volts; whilst the latter have cast-iron cases, and are for circuits up to 500 volts. Some new plug adapters and other electric light fittings of improved construction, a handy little bench drill and a small portable drill, fitted with adapters and ready for immediate connection to any lamp-socket, are also included in these lists. We note that the prices of a number of the above specialities have been reduced.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**CIRCUIT BREAKERS.**—The latest patterns of B.T.-H. automatic circuit breakers with magnetic blow-out are described in a new leaflet from the British Thomson-Houston Co., Ltd. (Rugby).

**CARBON LAMPS.**—A new catalogue of carbon filament lamps has been issued by Pope's Electric Lamp Co., Ltd. (Hythe Road, Willesden, N.W.), and will be sent on request to any trade friends of the company who have not yet received a copy. A large number of standard and special lamps for lighting are included, as well as radiator lamps and "lamps" for resistance purposes.

**AUTOMATIC FURNACE.**—A booklet from Clyde Evaporators, Ltd. (90 Mitchell Street, Glasgow) describes an improved type of furnace combined with automatic stoker, which we understand has been installed by them with considerable success in several boiler plants in Scotland. The furnace, which is applicable to all classes of boilers, is of "V" section, and the fuel is fed in by horizontal screws mounted on each side of the flue. The firebars form the sides of the V, so that the ash from the consumed coal falls to the bottom, and is forced to the front of the boiler by the ash screw. Forced draught is employed, to ensure a sufficient supply of air. Some of the advantages claimed for this furnace are complete combustion of fuel, and decreased coal consumption for same evaporation. Full particulars may be obtained on application to the makers.

**ALUMINIUM.**—A useful sheet from the British Aluminium Co. (109 Queen Victoria Street, E.C.) gives detailed weights,

dimensions, &c., of standard aluminium tubes, bars, strips, sheets, wires, &c.

**CRANE MOTORS.**—Full particulars of the special line of continuous-current motors which the British Thomson-Houston Co., Ltd. (Rugby), have developed for crane work are contained in an illustrated pamphlet.

**PORCELAIN INSULATORS.**—Another B.T.-H. pamphlet deals with a great variety of designs of porcelain insulators.

### HALF-WATT LAMPS FOR STATION LIGHTING

WE reproduce here two photographs which have been sent us by Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston), one showing the exterior, and another



FIG. 1.—STATION ENTRANCE LIGHTED BY HALF-WATT LAMPS.

certain platforms of a London terminus where Wotan half-watt lamps have been applied for lighting. The photographs

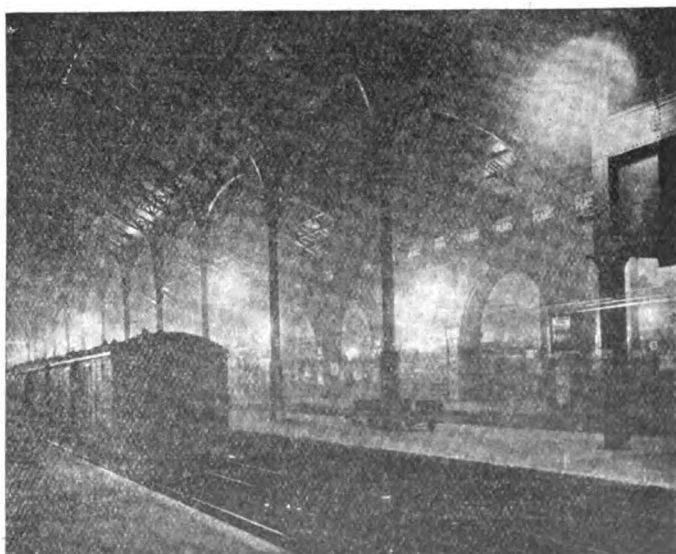


FIG. 2.—STATION PLATFORMS LIGHTED BY HALF-WATT LAMPS.

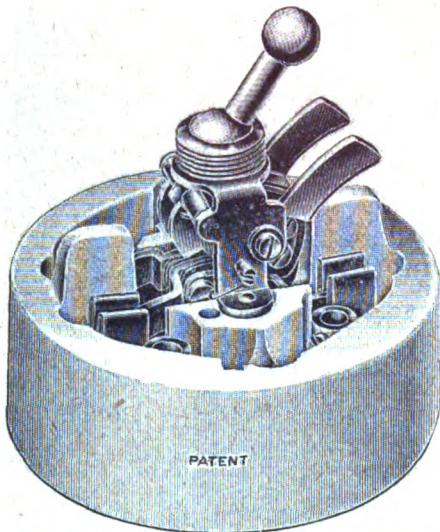
were taken about midnight, and have not been retouched. These lamps are of 1,000 c.p. running two in series on a 200-volt circuit, and are being used to replace a portion of



the arc lighting. The existing arc-lamp fittings have been converted for use with half-watt lamps in order to keep a uniformity of fitting, and it is quite probable that further circuits will be rearranged in a similar manner in the near future.

### A NEW "INTERMEDIATE" TUMBLER SWITCH

**A**N IMPROVED pattern of 10-ampere "pivot intermediate" tumbler switch has been introduced by A. P. Lundberg & Sons (477-489 Liverpool Road, London, N.), and is illustrated here. The main improvement consists in the substitution of knife-blade and double-spring-clip contacts for the original face contacts, in the elimination of the porcelain rocker, and in the use of a vitreous porcelain base, and of mica insulation on the moving part. The switch may be fitted with either brass or porcelain cover, and its dimensions are as follows:—Diameter of base,  $3\frac{1}{2}$  in., overall projection,  $3\frac{3}{8}$  in. The action of the switch is exceptionally "clean" and easy. The current-carrying parts are well sunk in the base, and provision is made for the attachment of an earthing



NEW PATTERN OF PIVOT INTERMEDIATE SWITCH.

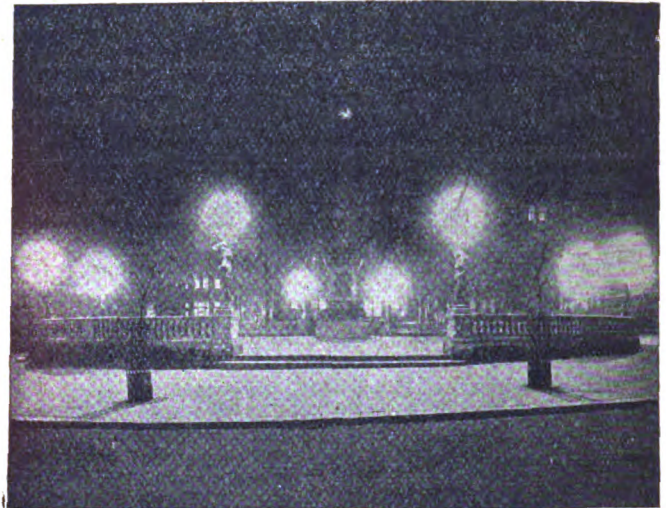
wire. Although primarily intended for use on two-way intermediate circuits controlling large numbers of lamps, the switch has many other uses, and by slight modifications may be converted into any one of the following types:—single-way, 20-ampere capacity; single-way with quadruple break; double-pole; two-way with definite gap in passing over; pilot; reversing; series-parallel; all-or-part. The last three modifications differ from the ordinary patterns of these types in having no "off" position. Some of these switches are extensively used for the control of heating apparatus and small motors, and others for certain of the lighting controls dealt with in the firm's well-known publication "Lektrik Lighting Connections." The reversing switch adaptation will be found much more convenient than some of the ancient forms still used in laboratory, testing, and other special apparatus.

### ALUMINIUM

**I**N order to dispose finally of the impression which was once common that the substitution of aluminium for copper as an electrical conductor was not justified on grounds of economy, the British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), have issued a very attractive illustrated booklet entitled "Power, Its Economical Distribution." The economics of the subject are carefully gone into, and the saving obtained by the substitution of aluminium for copper is shown for various prices of both metals. The important question of scrap value is then discussed, and the favourable position of aluminium in this respect is shown. Coming, then, to matters of detail, the rating of aluminium low-tension cables is treated in reference to the regulations existing in various countries. Particulars of aluminium cables with vulcanised bitumen, paper and rubber insulation, are given in useful tabular form, and a good deal of information on high-tension cables also appears. One of the most interesting sections is that devoted to jointing, where several kinds of mechanical connectors for stepped joints are described. The work throughout is copiously illustrated with actual examples of transmission lines, cables, and joints, and some charming views of the Company's works at Kinlochleven.

### HALF WATT LAMPS AT LEEDS

**W**E have received from the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), the illustration given here of Leeds City Square, which is now lighted by sixteen 500-watt 100-volt Mazda half-watt



CITY SQUARE, LEEDS, LIGHTED BY HALF-WATT LAMPS.

lamps, in the ornamental lanterns formerly used for the 750-watt arc lamps. The illumination is very intense and well distributed, and not only has the cost of current been reduced to two-thirds, but considerable saving in cost of maintenance has been effected.

### WATER SOFTENING

**A** PARTY of engineers visited the Hooton Water Works, Cheshire, recently, to inspect the "Permutit" water-softening plant, which is the first of its kind at a public water-works in this country. The water treated has an initial hardness of about  $19^{\circ}$  Clarke. The Company are bound by Act of Parliament to supply water at  $10^{\circ}$  of hardness, and after investigation of various systems of water-softening, it was resolved to instal the "Permutit" system, which is largely used in Germany. The process is based on an exchange of the calcium and magnesium salts which form the hardness of the water, for the sodium, which is the replaceable base in the "Permutit." This exchange is spontaneously effected immediately the water is passed through a layer of the material, the water going in at the top and issuing from the bottom completely softened. The "Permutit" is insoluble in water, and undergoes no visible change. It is capable of being regenerated over and over again by the simple application of a solution of common salt, which expels the lime and magnesia from combination and reinstates the sodium. This operation is carried out with the aid of two large ferro-concrete tanks, from which the salt solution is allowed to flow through the filters for twelve hours in the case of each battery alternately. The capacity of the plant is one million gallons daily. This water, which is softened to zero, is mixed with an equal quantity of hard water at  $19^{\circ}$ , the resulting two million gallons being sent to the mains with a hardness of  $9\frac{1}{2}^{\circ}$ . No precipitate or sludge is formed at any stage of the process, and the entire plant is looked after by two men.

**An American Electrical Engineering Handbook.**—A handbook of 356 pages, got up in the convenient style of the larger engineering pocket-books, is being issued by the Julian d'Este Co. (Boston, U.S.A.), and forms the electrical appendix to the d'Este Steam Engineer's Manual. A concise introduction deals with general matters and steam plant, while the main electrical portion of the work, by Mr. C. Penrose, deals in a practical way with testing and measurements, dynamos, motors, transformers, &c., pyrometry and photometry. A number of illustrations are given of types of electrical plant and typical American generating stations, and there are interesting notes on modern power-house and transmission-line equipment.

**Electric Charging for Commercial Vehicles.**—The County of London Electric Supply Co. are now prepared to charge electric vehicle batteries at their City Road station, and facilities have been provided for the drawing in and standing of the vans in question. All inquiries as to rates should be addressed to their head office, Moorgate Court, Moorgate Place, E.C.



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Aldershot.**—Natural draught cooling tower, chimney type. Borough Electrical Engineer. August 4th.

**Ashton-under-Lyne.**—Meters, motors, motor starters, and arc-lamp carbons. Borough Electrical Engineer. July 29th.

**Australia.**—The Deputy Postmaster-General, Perth, requires a supply of switchboard parts, also portable telephones, common battery telephones, &c. Further particulars, 72 Victoria Street, S.W., or 73 Basinghall Street, E.C.

**Burton-on-Trent.**—An expenditure of £7,000 is to be incurred for extensions at the power-station. The Local Government Board has sanctioned this expenditure without ordering an inquiry, a fact which has caused some satisfaction among the members of the Electricity Committee as indicating the Board's satisfaction with the manner in which the undertaking is carried on.

**Dublin.**—A Local Government Board inquiry was held last week concerning a loan of £82,000, of which £5,000 is for the conversion of public gas-lamps to electric lighting.

**Grimsby.**—One 790 ampere-hour battery, hand-regulated reversible booster, and switchgear. Borough Electrical Engineer. July 23rd.

**Holmfirth.**—The L.G.B. has expressed its general satisfaction with the electric light scheme recently put forward.

**Manchester.**—Sub-station switchgear (6,600 volts) and fuse boxes. Chief Electrical Engineer. July 24th.

**Oldham.**—In consequence of the illness of Mr. S. W. Newington, the Borough Electrical Engineer, the Council has had to call in Mr. Robert Blackmore, of Stalybridge, who has prepared an extension scheme involving an expenditure of £40,000.

**Redditch.**—The Local Government Board has given the Corporation permission to obtain tenders for the new plant under the £18,000 scheme of extensions recently inquired into. Sanction to the loan, however, has not been granted, pending the necessary receipt of further details from the Engineer.

**South Africa.**—The East London Council proposes to borrow £775 for extensions to switchgear, transformers, &c.

**Turton.**—Overhead and underground cables. Borough Electrical Engineer. July 23rd.

**Warrington.**—Extra high-tension and low-tension switchboard feeder panels. Borough Electrical Engineer. July 21st.

### Wiring

**Basingstoke.**—Tenders are to be obtained for wiring the town hall.

**Southampton.**—Wiring of Farm Institute, Sparsholt. Clerk to County Council. (See advertisement on another page.)

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barnsley.**—New town hall.

**Batley.**—Police court and station.

**Birmingham.**—Large scheme of asylum extensions (£130,000).

**Bradford.**—Cinematograph theatre.

**Brighton.**—Hostel for women students (£10,000). Education Committee.

**Dundee.**—Children's hospital.

**Guildford.**—New municipal offices.

**Ilkley.**—Cinematograph theatre.

**Liverpool.**—Extensions by Mersey Docks and Harbour Board (£226,500).

**South Shields.**—Theatre. Architect, R. H. Moreton.

**Torquay.**—New tuberculosis hospital.

**Wallasey.**—New secondary school.

**Wellington.**—New Council offices.

**Yarmouth.**—Elementary school.

### Miscellaneous

**Salford.**—Street flame arc lamps and lowering gear. Borough Electrical Engineer. (See advertisement on another page.)

**South Africa.**—The East London Council proposes to borrow £7,814 for tramway extensions.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Bristol.**—The Bristol Tramways & Carriage Co. has placed a contract for carbon-filament lamps with Siemens Bros. Dynamo Works.

**Crook.**—A tender for public lighting has been submitted by the Newcastle-on-Tyne Electric Supply Co. The price offered is 30s. per lamp per season for current, with a further 5s. 4d. per lamp for maintenance. If the Company is to do the switching on and switching off, an additional 11s. per lamp is quoted, making a total charge of 46s. 4d., as against the present charge of 45s. by the local gas company. The Council must also bear the expenditure on services from the cable to the lamp, and the conversion of the existing gas lamps.

**Dartford.**—The tender of Messrs. Fraser & Chalmers for a 1,000-kw. turbo-alternator, transformer, condenser, &c., at £4,554 has been accepted.

**Darwen.**—The following tenders have been accepted for two trams: Bodies, The United Electric Car Co.; electrical equipment, Dick, Kerr & Co.; trucks, The Brush Electrical Engineering Co.

**London: L.C.C.**—In October last year the Council accepted a tender by the Cedes Electric Traction Co. to supply a petrol-electric chassis for a fire escape van, at £890, delivery to be made by June 14th, 1914. The Fire Brigade Committee now reports that although the contract time has passed, very little progress has been made with manufacture of the chassis, and in consequence it recommends that the clause enabling the Council to determine the contract be put into force. It is also recommended that an offer of Leyland Motors, Ltd., to supply an escape van similar to eleven other vans now on order from the Company at £641 10s. be accepted instead.

The Great Northern Railway Co. has accepted the tender of Siemens Bros. Dynamo Works for a twelve months' supply of carbon-filament lamps and station lighting reflectors.

**Manchester.**—The alternator in the turbo-generator for Stuart Street, mentioned on page 403 of our last issue, is to be supplied by Siemens Brothers Dynamo Works and will have a continuous output of 6250 kw. at 3000 r.p.m.

**Sheffield.**—The tender of Messrs. John Walsh, Ltd., for wiring the workhouse buildings at £105 has been accepted.

**Stratford.**—The following tenders have been accepted:—Lighting battery, the Tudor Accumulator Co.; booster, Lancashire Dynamo & Motor Co.; switchboard, B. Thomas.

**York.**—The annual contract for carbon-filament lamps, radiator lamps, tantalum lamps, and tantalum traction lamps, has been placed by the Corporation with Siemens Bros. Dynamo Works.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £63 5s. to £63 15s. (Last week, £63 10s. to £64.)

**Reduction in Cable Prices.**—W. T. Henley's Telegraph Works Co., Ltd., announce reductions in the prices of rubber-insulated wires and cables which will have the effect of increasing the trade discounts on C.M.A. and Association flexibles to 33½, 15, and 10 per cent. respectively for the 2,500, 600, and 300 megohm grades; 25 per cent. for the 600 megohm non-Association cable, and 10, 15, and 10 per cent. for pure I.R. cable. Special prices are quoted at £8 5s. per mile per 1/18, and £7 15s. for 3/22 non-Association Class W. cable. Reduction have also been made in the prices of materials for the Henley wiring system, the discount for cables being 40 per cent. and for accessories 33½ per cent. The discounts on rubber-sheathed cables have been reduced to 17½, 15, and 10 per cent.

The Liverpool Electric Cable Co. have reduced discounts to the following figures: "Association Quality," 50 and 10 per cent.; Non-Association Quality, 50, 10, and 5 per cent. for sizes up to 7/16, and 50, 10, and 2½ for all larger sizes. Special net prices of £8 per mile for 1/18 and £9 10s. for 3/22 non-Association taped and braided cables are also quoted.



**Works Holidays.**—The works of the Midland Electric Manufacturing Co., Ltd. (Rea Street South, Birmingham), will be closed from Friday evening, July 31st, till Monday morning, August 10th.

**Works Outing.**—The Linolite Co. (25 Victoria Street, Westminster) had their outing on Saturday, the 4th inst., at Herne Bay. Mr. A. S. E. Ackermann, the Co.'s Engineer and Manager, and Mr. R. L. Matthews, the Assistant Manager, were both present.

**Bankruptcies.**—A Receiving Order has been made against Granville Burgess, 27 Museum Chambers, Bury Street, W.C. The first meeting of creditors will be held at Bankruptcy Buildings, Carey Street, on July 23rd at 11 a.m., and the public examination will take place at the same address on August 25th, at 11 a.m.

### LOCAL NOTES

**Dover: Bulk Supply.**—A draft agreement for a bulk-supply of electricity to the Corporation has been submitted by the Engineers of the South-East Kent Electric Power Co. The Borough Electrical Engineer suggested that the Committee should look into the agreement and see how far the prices would compare with the Corporation's present prices. He made a comparison two or three years ago, and did not think the price mentioned then would tempt the Corporation to take a supply of electricity in bulk.

**London: L.C.C.: Greenwich Generating Station.**—The work of repairing the turbo-generator, the insulation of which broke down in January this year, was entrusted to the makers, the British Westinghouse Co. The Highways Committee now states that the cost amounted to £1,615 16s., and that the repairs necessitated the renewal of the whole insulation at one end of the machine. This figure, however, includes £80 as the cost of certain spare windings which were found to be required.

**Loughborough: Position of Electricity Undertaking.**—In reporting a net profit of only £74 on the past year's working, the Chairman of the Electricity Committee confessed that he had hoped for a better result. The Department, however, he said, had been hit rather badly in the matter of coal, as no contract existed at the time of the strike. There had also been increased expenditure in other directions, but taking into consideration the fact that their plant needed extension to meet with the demand, the position was not one to be complained of. At the same time a considerable increase in revenue was necessary in the future.

**Luton: Distribution of Electricity Profits.**—The net profit on the electricity undertaking last year amounted to £4,793, and the Electricity Committee recommends that no portion of this shall be allocated to relief of rates. The sum of £1,000 is to be used for meeting capital expenditure, which the L.G.B. suggests should be paid for out of revenue, and after meeting one or two other items, such as renewal of valves and liners of engine, and the bonus to staff, the remainder is to be retained as working balance. There was considerable discussion upon these recommendations, but the Committee's proposals were finally passed by a narrow majority.

**Manchester.**—A Local Government Board inquiry was held last week concerning a loan of £68,000 for extensions in connection with the electricity undertaking. Some discussion took place during the inquiry upon remarks made by the inspector concerning an item of £10,000 for motors, which, the inspector suggested, should be paid out of revenue, as was done by many smaller local authorities. Mr. Hooper emphasised this point, and added that there was no object in borrowing money for capital purposes whilst at the same time the Corporation was contributing large sums from the electricity profits to relief of rates. It was, he said, a national question, and for the benefit of the whole community, that the cheapest possible power should be obtainable. There was no opposition to the loan.

**Sheffield: Use of Renewals Fund.**—A proposal by the Electric Supply Committee to pay the cost of two cooling towers now under construction, viz., £2,800, out of renewals fund was briefly discussed at the last meeting of the Corporation. A recommendation to refer the matter back for further consideration was carried.

**Progress of Electricity Undertaking.**—At the last meeting of the Corporation, Alderman Styring called attention to the fact that no less than £297,239 had been paid into the sinking-fund since the electricity undertaking had started, and as the total cost of the undertaking when purchased

was £308,608, this must be considered to be a very satisfactory result. This statement apparently seemed to move a number of Councillors to ask for concessions in the matter of price to various classes of users, including power users, publicans, and large shopkeepers, matters which will be taken into consideration by the Committee.

**Wimbledon: Electricity Accounts.**—There was a net profit of £3,471 on the working of the electricity undertaking last year, after meeting capital charges.

### APPOINTMENTS AND PERSONAL NOTES

We regret to record the death of Mr. S. W. Newington, who had been Borough Electrical Engineer at Oldham for the past twenty-one years, since the opening of the municipal electricity works there.

Mr. E. J. B. Lowdon, of Lowdon Bros. & Co., Dundee, has been elected President of the Electrical Contractors' Association of Scotland.

Mr. D. Neill-Keith has been appointed Switchboard Representative for Ferranti, Ltd., for the Lancashire District and Ireland.

The salary of Mr. C. W. Salt, Borough Electrical Engineer at Torquay, is to be increased from £350 to £450 by two annual increments of £50 each. On this understanding Mr. Salt waives any right to fees for capital works, and also agrees to remain with the Corporation until the contemplated extensions are completed.

The salary of Mr. H. E. Annett, Station Engineer to the Bolton Corporation, is to be increased to £250 per annum on his appointment as Resident Engineer at the new Back-o'-th'-Bank Station of the Corporation.

A recommendation by the Bath Electric Lighting Committee to increase the salary of Mr. F. Teague from £550 to £600 per annum has been carried in the Council by a majority of three votes, after a considerable debate.

An Assistant Lecturer is required in the Electrical Engineering Department of the Birmingham Municipal Technical School. Commencing salary £150 per annum. Applications to the Secretary by August 1st.

A Lecturer in Electrical Engineering is required at the East London College. Applications to Professor J. T. Morris by July 28th.

An Assistant Mains Superintendent is required at Derby. Salary £150 per annum. (See advertisement on another page.)

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Barcelona Traction, Light & Power Co.**—An offer has been made of £3,118,060 five per cent. first mortgage 50-year bonds at 82½. The Company owns or controls a large number of electric supply and traction undertakings, including the important Ebro Power Co., which will shortly complete a 152,000 h.p. equipment.

**Nairobi Electric Power & Lighting Co.**—At the annual meeting last week it was stated that the directors have under consideration a scheme for utilising some waterfalls on the Thika River which will give a minimum of 2,000 h.p. in the driest season. A new plant of 750 kw. will be laid down to deal with this. Mr. E. W. Monkhouse will probably visit Nairobi before a final decision is come to.

**Victoria Falls & Transvaal Power Co.**—Speaking at the annual meeting last week, when the report and accounts given in our issue for June 25th, page 378, were adopted, the Marquis of Winchester said that the Company had been hit during the past year by drought and labour troubles, and that, taking into consideration these facts, the past twelve months need not be viewed with any apprehension as to the future prosperity of the Company.

**Crompton & Co.**—At the annual meeting on Tuesday, the report and accounts given in our last issue were adopted. Mr. C. F. Tufnell, Chairman of the Company, in commenting upon the improved position of the Company under the new régime, said that not only was the business of the Company on a much sounder footing than formerly, but that in his opinion this remark would apply to the electrical trade as a whole, and he thought there was not much likelihood of a return of the insensate price cutting which prevailed in former years. The financial position was such that a more liberal distribution might have been made of the available surplus, but the directors felt the need for a conservative policy from the commencement.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 395 [VOL. X., No. 30]  
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THURSDAY, JULY 23, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

*The Engineering Journal of the Electrical Industry*

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

NOTES on the arrangements for the next session at some of the Universities and Technical Colleges are given on page 416.

A SCHEME for the establishment of a central testing Institution or National Electrical Proving House has been proposed. (Page 416.)

SOME interesting information, from German sources, about half-watt lamps is published on page 417.

SOME particulars are given of the measures taken to re-establish the supply after the flooding of Messrs. Spiers and Pond's generating plant in connection with the fire at their premises. (Page 417.)

THE system of pre-heating the air supplied to boiler furnaces has been in use for some time on a B. & W. marine type boiler at Poplar Electricity Works. Some particulars of the plant are given. (Page 418.)

SOME notes are given on the electrical installation at a hospital in Glasgow. (Page 418.)

A NEW omnibus driven by accumulators is described. (Page 418.)

THE use of a series multiplying resistance with a hot-wire voltmeter is discussed in our Questions and Answers columns. (Page 419.)

SOME of the Specifications published last week relate to wireless telegraphy, manufacture of lap-welded tubing, and tungsten filaments.—The Comptroller has

allowed the grant of one of the B.T.-H. Co.'s Patents for the manufacture of tungsten. (Page 420.)

AMONG the papers at the Congress of the Tramways and Light Railways Association was one by Mr. H. M. Sayers on "Tramway Experiences in Brazil." Mr. F. Bland and Mr. R. Humphries also read Papers on "Standard Tramway Rails" and "Rail Joints." (Page 421.)

As a protest against recent happenings, the Chairman and Managing Director of Marconi's Wireless Telegraph Co. resigned at the annual meeting this week, but were re-elected.—A Committee has been formed to consider the organisation of the telegraph service. (Page 421.)

HALF-WATT lamps are now obtainable in this country down to 500-watt sizes for 200 to 255 volts. Other new sizes are 200 and 300 watts at 100 to 130 volts, and 100 and 200 watts at 50 to 65 volts. A new projector lamp is also being introduced. Full details and illustrations of various makes, as well as an indication of the next sizes to be expected, appears on pp. 422-424.

EXPENDITURES are contemplated at Dublin (£80,300); Edinburgh (£220,000); Grimsby; Islington (£5,316); and Walsall.—Electric lighting schemes are under consideration at Blackrock and Hayle.—Cable is required in Rochdale; Australia; submarine cable in Canada; electric motors in South Africa; and an electrical equipment for a mint in China. (Page 425.)

THE Surbiton electricity undertaking, which is at present worked by Messrs. Callender's, is to be transferred to them completely.—A number of municipal electricity accounts for the past year show exceedingly satisfactory results. A feature of them is the large sums paid out of revenue for works of a capital nature.—The Bristol undertaking has increased its output by 50 per cent. during the past two years.—An electrical section of the Chamber of Commerce is to be formed at Blackburn. (Page 426.)

**Electric Power at a Cement Works.**—A party of members of the Junior Institution of Engineers paid a visit last Saturday afternoon to the Tunnel Cement Works, Purfleet. The party were shown the chalk quarry, the mills, and the two large rotary kilns, each 210 ft. long, and the power station, which contains a 1,200-kw. turbo-alternator of the A.E.G. impulse type, with a steam consumption of 13·8 lb. per kw-hr. on full load, with a cooling water supply of five gallons per lb. of steam. The motors have been assembled in special motor rooms, so that they are in a large measure protected from dust. Open type motors are used, with special insulation and dust-proof bearings. The switchgear is of a most substantial type throughout, all motors being provided with oil-immersed controller type starters with self-contained resistances. The smaller motors are fitted with air circuit-breakers in dust-proof cast-iron cases, and the larger machines with sheet-iron switch pillars containing oil switches.

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

THE full course in Electrical Engineering at the University of Birmingham extends over four years, and qualifies for the degree of B.Sc. Sir Oliver Lodge is Principal, and the Electrical Engineering Department is presided over by Prof. Gisbert Kapp. Mr. E. J. Kipps and Dr. T. F. Wall are lecturers in Electrical Engineering. The next session begins on October 6th, and full particulars of the courses can be obtained from the Secretary.

The session for 1914-15 at the University of Liverpool will begin on October 8th. The Electrical Engineering Section of the Faculty of Engineering is under Prof. E. W. Marchant, and lectures in Municipal Electrical Engineering are given by Mr. A. Bromley Holmes. The prospectus may be obtained from Mr. E. Carey, Registrar.

At the Electrical Engineering Department of the City and Guilds (Engineering) College, Imperial College of Science and Technology, South Kensington, which is under the direction of Prof. T. Mather, F.R.S., complete courses are given leading up to and including the highest specialised instruction for students, with the object of fitting them to take leading positions as electrical engineers, scientific advisers, investigators, or experts, and for those already qualified who desire to take up more advanced training and research. Further information may be obtained from the Registrar.

The next entrance examination at the City and Guilds Technical College, Finsbury, will be held on September 22nd. The instruction at this College, of which Prof. Silvanus P. Thompson is Principal, is adapted to various classes of students, including those from secondary schools who desire to receive practical and scientific training bearing on their future work, and those who have already had experience in works and require a more systematic training in electrical engineering science. Particulars can be obtained from the Registrar, Leonard Street, Finsbury, E.C.

The next session at the Armstrong College, Newcastle-on-Tyne (University of Durham), the Electrical Engineering Department of which is under Dr. W. M. Thornton, will commence on September 28th. Full particulars can be obtained from Mr. F. H. Pruen, Secretary.

The next session at the Manchester Municipal School of Technology (University of Manchester) will open on October 6th. Courses are arranged leading to degrees in the Electrical Engineering Department of the Faculty of Technology.

A course of instruction in Electrical Measurement and Practical Electricity, by Dr. E. Taylor Jones, Professor of

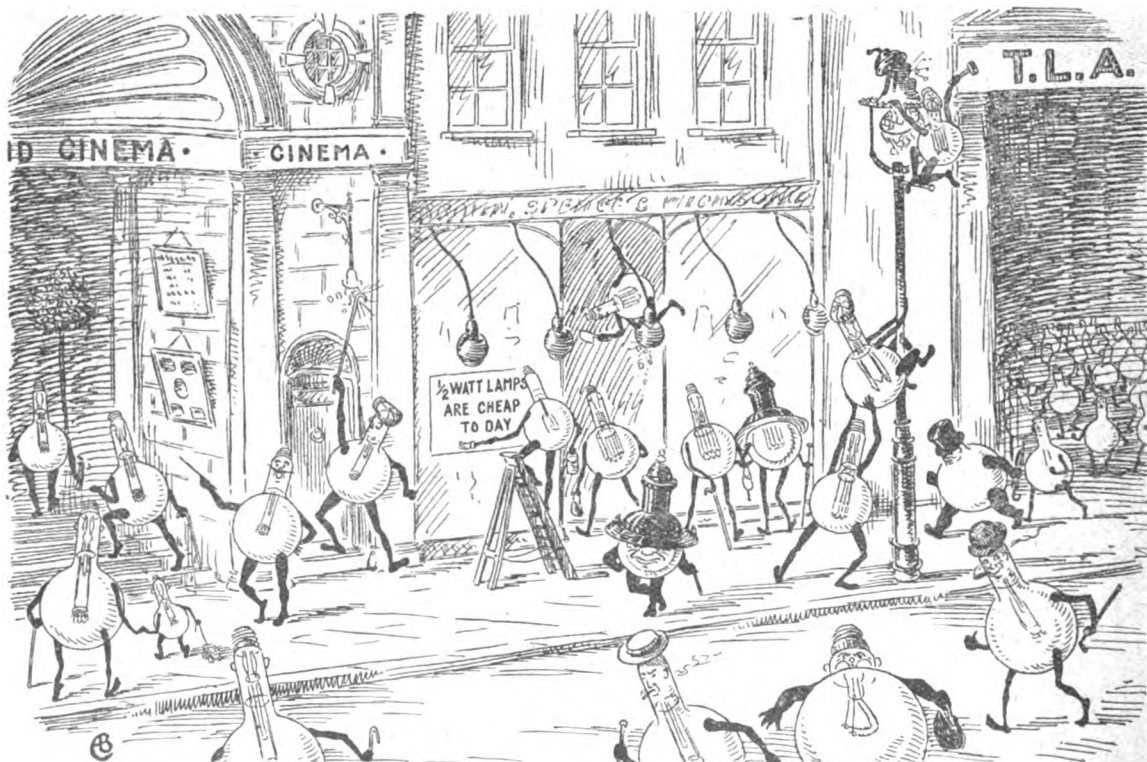
Physics, and Mr. W. E. Williams, Assistant Lecturer in Electrical Engineering, is given at the University College of North Wales, Bangor. For prospectus apply to Mr. J. E. Lloyd, Secretary.

Theoretical and practical training in all branches of Electrical Engineering is given under Prof. W. Robinson at University College, Nottingham. The three years' course prepares for the London B.Sc. degree. The next session commences September 28th. Particulars can be obtained from the Registrar, Dr. J. D. Black.

Among the examination results at the University of Bristol in the Faculty of Engineering are the following:—Examination for the degree of M.Sc. (Pass), R. A. Bruce and A. J. S. Pippard. Final examination for degree of B.Sc. (Electrical Engineering) Pass:—N. J. Rose, E. L. Sainsbury, and J. A. Smale.

## A PROPOSED ELECTRICAL PROVING HOUSE

IN view of recent discussion of the necessity for electrical goods for Canada complying with the code of the Chicago Board of Underwriters, Mr. C. H. Wordingham sends us a copy of a long letter which he addressed last year to the Institution of Electrical Engineers. Now that the Industrial Committee has been abolished, permission has been given for the contents of the letter to be published. Mr. Wordingham urges the desirability of founding a central Testing Institution, to be called the National Electrical Proving House, where tests could be made of types of apparatus for compliance with such regulations not only for goods to be exported to Canada, but with standards to be set up by the British electrical industry. He proposes that the Proving House should not draw up these rules, but that as regards articles for use in consumers' installations, this should be done by the Institution of Electrical Engineers, while detailed specifications should continue to be formulated by the Engineering Standards Committee, and experimental investigations conducted by the National Physical Laboratory. The Proving House should aim at testing types of apparatus rather than every individual article. The control should be vested in a council including representatives of Government departments and the various electrical interests, and the work should be under the direction of an engineer of high standing. In the early stages of the work the Proving House would have to be subsidised by the various interests concerned, but later on the money received in fees would probably render it self-supporting. A reference to the existing arrangements in this connection is made on page 417.



Reduced Prices and New Sizes of Half-Watt Lamps were announced on Monday.

## RECENT INVESTIGATIONS WITH HALF-WATT LAMPS

A SMALL treatise on the "Nitra" lamp by Dr. K. Mey, recently published in Germany by the *Allgemeine Elektrizitäts Gesellschaft* gives some interesting details of the development of the half-watt lamp. After stating that the limit of efficiency of the tungsten lamp should be about 0.2 watt per candle when the temperature of the filament would reach  $2900^{\circ}\text{C}$ ., the melting point of the metal, the author points out that the obstacle to attaining a temperature approaching this is the disintegration of the filament. This disintegration is not due to any electrical cause, but purely to the volatilisation or flying off of the rapidly oscillating tungsten molecules. Filling the globe with an inert gas to prevent this volatilisation had been tried years ago without success in the case of carbon filament lamps, and it was at first not expected that it would give any better result with tungsten filaments. As we have stated in previous articles, it was not successful with the ordinary straight filaments, as the energy lost by conduction and convection counteracted the gain in efficiency due to the high temperature of the filament, but by winding the filament into a spiral and by confining it to a small space with a small surface exposed to the gas, the heat transference was reduced sufficiently to make the introduction of the gas worth while. There is still a certain amount of disintegration and this, of course, affects the low candle-power lamps with filaments of only 1/50 mm. diameter to a much larger degree than the high-candle-power lamps with filaments of 1/8 mm., as the disintegrated layer in a given period is a much larger proportion of the whole in the former case. The lamps are filled with nitrogen at a pressure of about two-thirds of an atmosphere in order that the pressure shall not be great enough when hot to burst the globe.

The "efficiency" of the half-watt lamps is now expressed in watts per hemi-spherical (Hefner) candle power, the figure being 0.5 watt exactly. The average spherical "efficiency" is about 0.65 watt per Hefner candle, as compared with the figure of 1.4 watt/candle for the ordinary tungsten lamp. The spiral of a 1000 candle power lamp (110 volt) has a length of about 14.5 cm. and a diameter of about 0.62 mm., so that the surface candle-power works out at about 10.7 Hefner Candles per square mm. Experiments have proved that the candle-power decreases about 20 per cent. after the first 80 hours of burning. Dr. Mey estimates the temperature of the half-watt lamp filament at  $2400^{\circ}\text{C}$ . or  $300^{\circ}\text{C}$ . above that of the ordinary tungsten lamp filament when working at one watt per candle. The light of the half-watt lamp is consequently much whiter and nearer daylight than that of the ordinary tungsten lamp.

Some highly interesting experiments on the absolute light efficiency of the half-watt lamp were described by Dr. H. Lux in the *Elektrotechnische Zeitschrift* of May 28th. These experiments showed that the percentage of emitted radiant energy (heat and light rays) to the total energy supplied was only 60.2 per cent. from the half-watt lamp as compared with 83.4 per cent. from an ordinary Osram lamp, the lower figure being due to the loss by convection in the gas. On the other hand, owing to the higher temperature of the filament in the half-watt lamp, the visible radiant energy was 8.04 per cent. of the total radiant energy as compared with a percentage of 3.76 in the case of the ordinary metal filament. As a final result, the percentage of light energy to the total energy input or the absolute light efficiency is 4.82 per cent. for the half-watt lamp as compared with 3.32 per cent. for the ordinary lamp. [The corresponding "efficiencies" or specific consumptions were 0.56 and 1.47 watts per Hefner spherical candle-power.] It is interesting to note that the 1000 c.p. half-watt lamp, absorbing 525 watts, gave out over 25 watts in light energy.

The experiments were made with highly accurate apparatus and compare very well with previous determinations by other authorities. Thus W. Coblentz, of the Washington Bureau of Standards, found the percentage of light energy to total radiant energy from the half-watt lamp to be 7.6 per cent., as compared with Dr. Lux's 8.04 per cent.

Dr. Lux points out the fact that for the same temperature of filament, for example,  $2400^{\circ}$  absolute, the ordinary metal filament has an efficiency nearly 19 per cent. higher than the "half-watt" filament in nitrogen, the figures being 0.76 spherical candle per watt and 0.64 spherical candle per watt respectively. This is partly due to the loss of energy by convection in the nitrogen-filled globe of the half-watt lamp. According to Langmuir's experiments, this loss by convection is reduced to about one per cent. only when the filament is

wound in a spiral of about 2 mm. diameter, and Dr. Lux asserts that the remaining loss of 17 per cent. or more is due to the wasted light given off into the interior of the closely-wound spiral. This wasted light is, of course, converted into heat, and helps to account for the low percentage of energy converted into radiant energy (60 per cent. as compared with 88 per cent. for the Osram lamp) in the case of the half-watt lamp tests described above.

## THE FIRE AT SPIERS AND POND'S

THE fire in the early hours of Wednesday morning of last week at Spiers and Pond's premises in Water Lane, off Queen Victoria Street, entailed damage by water to the firm's private generating plant which supplies not only the whole of Spiers and Pond's stores and adjoining departments, but also the Holborn Viaduct Hotel and one or two other private customers. Although the fire originated in the lower part of the building, travelling up the lift shaft and burning out the upper floors, the stoppage of the generating station was not due to fire, but to it being flooded with water pouring down the lift shaft. The station, which was established about twenty-five years ago, and has scarcely been altered since, contains six 52-kw. bipolar Mather & Platt continuous-current generators driven by Willans engines supplied from Babcock & Wilcox boilers with underfeed stokers. The water in the boiler-house reached right up to the grates, but in the engine-room, which is on a slightly higher level, did not quite reach the armatures. The cables from the machines to the switchboard were, however, submerged. It reflects great credit on the staff that the water was pumped and baled out, and the boilers under steam again by 5.30 in the afternoon, and that after a certain amount of drying out the generators were put on to a limited amount of load by 9.30, while the work of renewing the cables to the switchboard was at once put in hand.

In the meantime, however, efforts were made to obtain a temporary supply for the Holborn Viaduct Hotel, and after negotiations with the supply authorities in the district, instructions were given about midday to the City of London Electric Lighting Supply Co. to proceed with arrangements for connecting up the hotel to their A.C. mains, and by 3.30 all was planned out and work was started. Cable was run from the other side of Holborn through a subway, but 4 ft. of concrete had to be cut through to effect an entry into the basement. The cable was then led up the building to the main switchboard at the back of the first floor by a route involving a total run of cable of about 300 ft. An extremely smart piece of work was accomplished, and the supply to the hotel was started by 7 o'clock that evening. As the supply was alternating, a few fans and other small motors had to be disconnected.

In the case of Spiers and Pond's own premises, one of the most serious matters was the stoppage of the refrigerating plant, which is driven by two 40-h.p. 110-volt continuous-current motors. The City of London Co. promptly offered to replace these by A.C. motors, and have the plant running again the same day, which would have been a very smart piece of work considering the difficulty of access to the small underground chamber in which their plant is placed, but this course was not considered necessary, and the motors were started up again at 6 o'clock on Thursday morning.

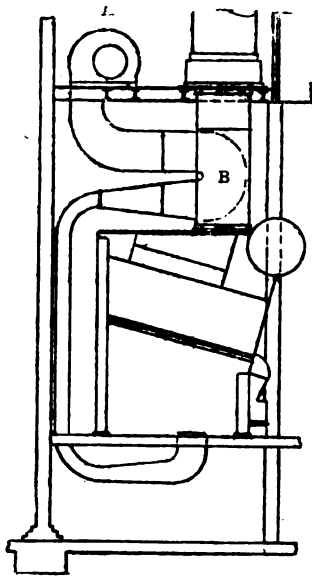
Great credit is due both to Messrs. Spiers and Pond's own electrical staff and to the City of London Co. for the prompt way supply was got going again, and mention should also be made of the assistance rendered by the Salvage Corps in protecting the machinery from damage as far as possible. We wish to express our thanks to Mr. F. Kieffer, Chief Assistant to Messrs. Spiers and Pond's Engineer, who showed our representative over the plant after the fire.

**Electrical Exports for Canada.**—We have received from the B.E.A.M.A. a copy of a letter to them from Mr. Dana Pierce, Engineer to the Underwriters' Laboratories, National Electrical Code, Chicago, regarding the arrangements for inspecting electrical apparatus destined for Canada, which has to conform with the United States Electrical Code. Mr. Pierce points out that Messrs. Heap & Digby (48 Westminster Palace Gardens, Victoria Street) represent the Underwriters' Laboratories in England and undertake examinations of all such apparatus. The American Code naturally represents practice differing in some respects from that prevailing here, and British manufacturers must expect to have to adapt their wares to some extent to the special requirements existing in Canada. It is, of course, impracticable to discuss all these differences of practice in a general review of the code, but it is always open to manufacturers to raise any points of detail which it is desired to consider.



## PRE-HEATER AT POPLAR ELECTRICITY WORKS

IN view of the controversy as to the advisability of heating the air which is supplied to boiler furnaces, we give below some particulars of the air-heater which has been in use at the Poplar Electricity Works for some time. The general arrangement of the system can be seen from the drawing below. Air is drawn from the heated interior of the boiler-house by the fan A, and is forced through the heater B and down the delivery pipe, which passes underneath the boiler. From here two branches are taken, one to each grate, so that the heated air enters through the fire bars, passes up through the burning fuel, and thence through the heater, where it serves, in its turn, to heat the incoming air, and from here up the chimney. The boiler is a Babcock & Wilcox marine type, with heating surface of 6,295 sq. ft. fitted with "Underfeed" stoker having a grate area of 154 sq. ft. The air-heater, which was supplied by the Underfeed Stoker Co., has a heating surface of 3,132 sq. ft. The superheater, which is by Babcock & Wilcox, has heating surface of 1,131 sq. ft. The following figures are from a test which was made on the boiler immediately after the air-heater had been installed.



ARRANGEMENT OF AIR HEATER.

Since then some improvements have been effected, so that the results obtained at present are somewhat better than are here shown:—

Duration of test	9 hrs.
Temperature of air entering heater	105° F.
Temperature of air leaving heater	214° F.
Temperature of gases leaving boiler	579° F.
Temperature of gases leaving heater	401° F.
Power taken by fan	19 kw.

Equivalent evaporation from and at 212° F. = 6.19 lb. per hr. per sq. ft. of heating surface.

In passing through the heater the air is caused to flow through a number of narrow channels, the outsides of which are scrubbed by the hot flue gases. Each day all deposited soot is removed from the inside of the heater by steam sprays, which are fed with live steam by 1½-in. diam. pipes, the time occupied being about ten minutes. Apart from this the attention required by this heater is practically nil. Although the results obtained from this heater are not quite so good as are obtained from an economiser which is fitted to a similar type of boiler in the same station, there is no reason to doubt that in many cases the system of pre-heating may be adopted with advantage. We are indebted to Mr. J. H. Bowden, Borough Electrical Engineer, Poplar, for the details given above, and for permitting us to inspect the pre-heater at the Poplar works.

## A HOSPITAL INSTALLATION

THE extent to which electricity is employed in a modern hospital is strikingly exemplified in the equipment of The Royal Hospital for Sick Children, Yorkhill, Glasgow, which was opened by the King and Queen recently. Artificial illumination is provided for by nearly 2,000 electric lamps. Thirteen lifts and the whole of the laundry, kitchen, and other machinery are worked by electric motors, of which there are in all upwards of forty. The ventilation is entirely

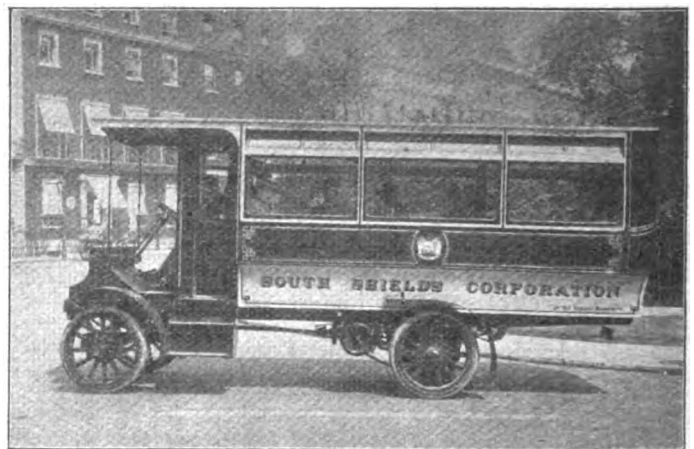
by electrically-driven fans. There is an extensive inter-communication telephone system having thirty stations, in addition to the Post Office instruments, of which there are five. The clocks throughout are electrically operated and controlled as also are the several bell systems. In addition to these ordinary utilitarian services there is the very extensive and varied use of electricity in electro-surgery, Röntgen ray, high frequency, and other special apparatus too numerous to mention in detail.

The electrical supply is from the Glasgow Corporation mains, and is brought in duplicate cables to each of two main switchboards in the basement. The arrangement constitutes a very reliable safeguard against interruption of supply. The operating theatres are provided with similar duplication with the same object. The equipment has been installed almost entirely by the following firms: Telford, Grier & Mackay, Ltd., carried through the lighting and general electrical installation work; R. Waygood, Ltd., the lifts; and D. & J. Tullis, Ltd., the laundry machinery. Royal Edisonwan drawn-wire metal filament lamps are used throughout. The electric clock and telephone systems are by the Magneta Time Co. and the Sterling Telephone Co respectively. Expert service on behalf of the Hospital Board has been rendered by Messrs. James E. Sayers & Caldwell, Consulting Engineers, of Glasgow.

## EDISON BATTERY OMNIBUSES

CONSIDERABLE interest attaches to the two electric omnibuses which have just been supplied by Edison Accumulators, Ltd. (203 Duke Street, Piccadilly, S.W.), for public service in South Shields. These vehicles are to be used by the Corporation as feeders to the tramway system, and are to run over a route about 1½ miles in length, which includes two gradients, one a sharp dip down to a level crossing, and the other a bridge over a railway.

The vehicles, one of which is illustrated here, are of the single-deck pattern to seat twenty-two passengers, and weigh about 8½ tons unloaded. The battery is contained in sheet-steel housings in two longitudinal sections in the body under the seats, and consists of sixty cells of the Edison A-8 type, with a capacity of 300 ampere-hours at 65 volts. The battery weight is 1,800 lb. One motor is employed, and this is mounted under the driver's footboard, and the transmission is



EDISON BATTERY OMNIBUS FOR SOUTH SHIELDS.

by a propeller shaft to a differential bevel countershaft and side chains. The motor is of the four-pole series, totally-enclosed type, with cast-steel case and laminated pole-pieces, oil-retaining ball-bearings, and specially large commutator. The drum-type controller is placed under the front hood. It is actuated by a lever to the left of the steering column, and provides for four forward speeds and two reverse. The brake pedals are interlocked with a cut-off switch. An ampere-hour rocker is mounted flush into the dashboard. The vehicle is designed for a speed of 12 miles per hour on the level, and during recent trials in London, Aubrey Road, Holland Park, where the maximum rise is 1 in 8 and the average 1 in 10, was climbed at about 6 miles per hour. From 40 to 50 miles can be obtained per full charge on good roads, and with short boosting at the termini between each trip, 80 to 100 miles per working day. The body is of a special design, with front entrance, and the lighting is furnished by an independent Edison battery of six A-4 cells arranged to be charged with the traction battery at night. We understand that a similar vehicle is being put into service at Southend.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,401.

As a charge-engineer of a generating station, what would you consider the minimum temperature of the coils of a generator or transformer at which you should report that something was wrong? (A) In the case of cotton insulation. (B) In the case of mica or micanite insulation.

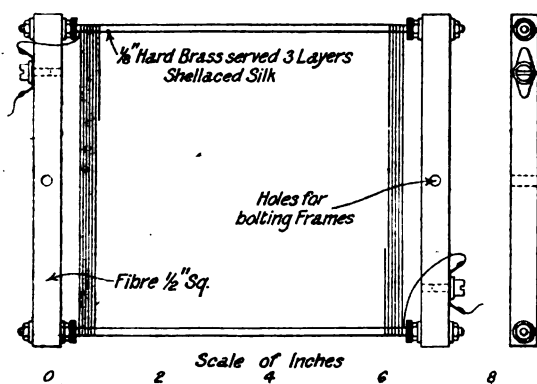
(Replies must be received not later than first post, Thursday, July 30th.)

### ANSWER TO No. 1,399.

A Hartmann & Braun hot wire voltmeter is used on A.C., and has a scale of 0-250 volts. It is desired to use this instrument for a range of 0-500 volts by multiplying present scale by two. How can this be accomplished?—METER.

The first award (10s.) is given to "INSTRUMENTS" for the following reply:—

Since the Hartmann and Braun hot wire voltmeter is for all practical purposes non-inductive, it will be safe to add in series a non-inductive extra resistance of the same value as that of the present voltmeter. The instruments of 250-volt range have usually a negligible temperature error, but it will be a wise precaution to measure the voltmeter resistance hot—heated by the usually measured voltage being applied for about twenty minutes. A suitable form of non-inductive resistance can be constructed by winding single silk-covered manganin or eureka wire on such a frame (or frames) as is shown in sketch. The size of wire to be used depends on the current taken by the instrument at its maximum deflection—usually of the order of 0.1 to 0.15 amperes. As a guide it



may be pointed out that 0.006 manganin or eureka wound open (i.e., the turns not touching) on the suggested frame will carry safely 0.06 ampere, while 0.008 wire will carry about 0.1 ampere. The resistance may be adjusted on the bridge, and finally checked by measuring its resistance immediately after a twenty minutes' application of about 250 volts. If a Wheatstone bridge is not available, the extra resistance may be adjusted till it halves the voltmeter reading when put in series with it, a constant voltage being employed.

Thus if the instrument alone reads 240 on the application of this voltage, the extra resistance should reduce this reading to 120 when put in series. Sometimes the Hartmann and Braun voltmeters are supplied with small figures over the scale beside the voltage figures. These give the current taken by the voltmeter at the several deflections. If this is the case with "Meter's" voltmeter the settling of the size of wire to use is simplified, as no resistance measurement of the instrument will be required. The makers will usually give the current taken if the instrument number is given.

The second award (5s.) is given to "W. H.," who writes as follows:—

It will be found that a considerable amount of power is wasted when using a Hartmann and Braun hot wire voltmeter on a 500-volt circuit. The current taken by these instruments is usually in the neighbourhood of 0.25 amperes, and the "wire" itself has a resistance of approximately 20 ohms. This means that the total resistance of the voltmeter will be about 1,000 ohms. It will be best to measure the actual voltmeter resistance on the Wheatstone bridge, and then to wind bobbins with resistance wire up to exactly the same number of ohms as the total voltmeter resistance. In order to use the voltmeter on 500 it will be necessary to connect the resistance box in series with the voltmeter itself.

The scale reading will then, of course, be multiplied by two to give the actual voltage of the circuit. It would be as well to have a voltmeter switch to save the power that would otherwise be wasted when the voltmeter reading is not actually required. I would suggest winding the resistance of, say, Eureka wire on small bobbins, the bobbins to be fixed in a ventilated wooden box provided with the necessary terminals. If a switch is used it will probably be satisfactory to use about S.W.G. 30 Eureka wire, and as, approximately, 1,000 ohms will be required, this will mean about 179.4 yds. of double cotton-covered wire, or 1/4 lb. bare weight of wire. Allowing for insulation, this will be about 3 lb.

This wire could be wound on about six wooden bobbins, each about 2 1/2 in. long by 1/2 in. diameter, and allowing 1/2 in. depth of winding. As it is for use on an A.C. circuit, it will be advisable to wind the wire non-inductively. This can be done by winding two wires simultaneously, after first soldering the ends together. These six bobbins could be mounted in a small wooden box about 6 in. by 4 1/2 in. by 1 1/2 in. provided with plenty of holes for ventilation purposes.

The "hot" wire of a Hartmann & Braun voltmeter is made of platinum iridium, which has a lower temperature coefficient than the platinum silver formerly used. Its resistance, however, is so small a part of that of the whole instrument that it is unnecessary to allow for its temperature coefficient in the series resistance (as has been suggested in some replies received) or, except as a general precaution, to recalibrate the instrument. —[Ed. E.E.]

**An Electric Emergency Vehicle.**—The West Ham Corporation has ordered an interesting vehicle for emergency work on their tramway and supply system. This will consist of a one-ton lorry chassis supplied by Edison Accumulators, Ltd., fitted with the usual type of tower and platform for working on tramway overhead lines and poles. The whole of the tower and superstructure, however, will be arranged so that it can be removed from the chassis in a few minutes, and a plain float can be affixed in place of it, so that the vehicle becomes available for mains emergency work, and general transport service. The equipment will also include substantial watertight lanterns and flexibles for night work, a portable electric drill, and a small electrically-driven centrifugal pumping outfit for emptying flooded substations and similar work.

**Electrolytic Disinfecting Fluid.**—It is now eight years since the manufacture of electrolytic hypochlorite disinfectant was taken up by the Borough of Poplar, and the annual report for 1913 records an output of 66,740 gallons during the year at a total cost of £135. The success of the process used, in which the hypochlorite of magnesia solution is prepared by the electrolysis of Water Board water, containing certain definite proportions of sodium chloride and magnesium chloride, is shown by the fact that in addition to the plants already supplied to the British War Office and Admiralty, quite recently plants have been sent to Finland, Buenos Aires, and Rangoon. The Gateshead Municipal Corporation have also given an order for a plant to be erected, and while this report is being written, a large plant is being installed for the Portsmouth Corporation. It is interesting to note that in the last case the fluid to be electrolysed is sea-water itself, which, of course, is close at hand, and a ready and powerful disinfectant is manufactured by this process without cost of materials, but merely that of electric current. Various improvements have been made in the plant since it was first installed, and a non-creeping slate cell is now replacing the original earthenware cells.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published July 16th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

**14,140/13. Wireless Transmitter.** W. P. THOMPSON (*Cie Universelle de Telegraphie et de Telephonie sans Fil*). An arrangement by which a high-frequency, heavy current generator can be made to supply current efficiently, and at double the original frequency, to the antenna. Two or more similar transformers are used. Each transformer has a closed magnetic circuit and primary, secondary and auxiliary windings. All the primaries are connected in series, and are excited by the generator; the secondaries are also connected in series, and supply current to the antenna. The auxiliary windings are wound on the transformers so as to produce a flux at right angles to the main flux in each case. They are connected in series, and are excited from a source of direct current. It is found that the above arrangement obviates the heavy losses which have hitherto been encountered when "tight coupling" of the transformer circuits has been used. Also the secondary frequency is found to be twice that of the generator. Two figures.

**16,066/13. Tungsten Filaments.** E. A. KRÜGER. Powdered tungsten is mixed with about 1.0 per cent. of boracic acid and 0.1 per cent. of carbon, and compressed into a rod. The latter is then heated to 1000-1200° C., the temperature being maintained for some time. An electric current is then applied, and the temperature is raised to 1200-2000° C., during which process a stream of hydrogen is passed through the heating chamber. The rod may then be hammered, rolled, and drawn into wire.

**5,478/14. Decrement Meter.** F. A. KOLSTER. An instrument for measuring the logarithmic decrement of circuits such as are employed for wireless signalling. It consists of a hot-wire ammeter in series with an inductance and a variable condenser. The plates of the latter are so shaped that the capacities of the condenser for different positions of its plates vary according to the law of geometrical progression. In use, the instrument is inductively coupled to the circuit of which the decrement is to be measured, and the capacity is adjusted to give a maximum deflection on the ammeter. The capacity is then decreased until the ammeter reading is reduced to half its maximum value. The spindle for rotating the condenser plates is now mechanically connected through gearing to a graduated dial, and the capacity is increased by rotating the spindle until the ammeter reading rises to the maximum and then falls to the half maximum value again. The movement of the spindle is registered by the rotating dial. The reading obtained is the sum of the decrements of the circuit under test and of the instrument circuit. By subtracting the latter, the required decrement is obtained, without the necessity for elaborate calculations. Six figures.

**8,595/14. Welding Machine.** A.E.G. A continuous strip of thin metal is passed through rollers, which bend it into tubular form with edges slightly overlapping. This tube then passes over a smooth mandrel, the end of which is large enough to completely fill the bore of the tube. The welding roller presses upon the lap seam and is connected to one pole of the generator. A larger conducting roller engages the side of the tube opposite the welding roller. Most of the current passes through the mandrel in flowing from the point of welding to the conducting roller. Hence very thin tubes can be successfully lap-welded by this process. Three figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Electrodes] 18,355/13.

**Distributing Systems, Cables and Wires, &c:** MELLERSH-JACKSON (*U.S. Light & Heating Co.*) [Dynamo regulating systems] 12,578/13; HARRIS [Relay systems] 15,251/13; STORER [Motor control] 22,390/13.

**Dynamos, Motors and Transformers:** LJUNGSTROM [Dynamo windings] 4,979/14; SIEMENS SCHUCKERTWERKE GES. [Induction regulators] 10,493/14; R. BOSCH [Brush-holders] 10,945/14.

**Electrometallurgy and Electrochemistry:** RENNERFELT [Furnaces] 226/14.

**Ignition:** KETTERING and CHRYST [Ignition systems] 7,465/14.

**Incandescent Lamps:** SCOLAR and DICK, KERR & Co. [Metallic

filaments] 14,807/13; WESTINGHOUSE METALLFADEN GLUHLAMPEN-FABRIK GES. [Lamps] 540/14; BIRKETT and WEISS [Lamps] 6,050/14.

**Storage Batteries:** SCOTT [Regulators for accumulator charging] 14,741/13; FOSS, HARRIS and PARKER [Alkaline accumulators] 16,027; PORDES [Battery casing] 5,506/14.

**Switchgear, Fuses, and Fittings:** VON VANGEL [Automatic contact apparatus] 12,428/13; COX [Fuses] 17,174/13; ROGERS and DAVIES [Safety device for motors] 24,226/13.

**Telephony and Telegraphy:** BALSILLIE [Wireless transmitter] 15,673/13; DERRIMAN (*Russell*) [Telephone systems] 15,748/13; SHAW [Telephone systems] 5,246/14.

**Traction:** STEVENS [Petrol-electric vehicles] 15,516.

**Miscellaneous:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Vacuum tubes] 14,892/13; ACCUMULATOR FABRIK AKT. GES. & RÜSSE [Fire-damp detector] 15,064/13; EDWARDS [Signalling apparatus for collieries] 4,436/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables, Wires, &c:** SOC. D'ELECTRICITÉ DE PARIS [Relays] 13,335/14; SIEMENS SCHUCKERTWERKE GES. [Tensioning overhead conductors] 14,683/14.

**Dynamos, Motors and Transformers:** SIEMENS SCHUCKERTWERKE GES. [Polyphase commutator machines] 13,136/14; A. E. G. [Mercury rectifiers] 15,076/14.

**Electrometallurgy and Electrochemistry:** SOC. ANON. L'OXY-HYDRIQUE FRANÇAISE [Electrode carriers] 13,589/14; MACHALSKE [Electric furnaces] 15,455/14; [Electrodes] 15,456/14; [Ore smelting] 15,457/14.

**Ignition:** SOC. D'ELECTRICITÉ NIMELIOR [Oiling of magnetos] 15,352/14; BETHENOD [Magnetos] 15,353/14.

**Telephony and Telegraphy:** BURFEIND [Telephone systems] 14,808/14; DARRAS [Condensers] 14,834/14; GIRARDEAU [Spark-gaps for wireless] 14,884/14.

**Traction:** CIE. DE SIGNAUX ELECTRIQUES POUR CHEMIN DE FER [Railway signalling] 13,961/14.

**Miscellaneous:** SIEMENS SCHUCKERTWERKE GES. [Searchlights] 13,920/14.

The following Amended Specifications may now be obtained:—

**Switchgear, Fuses, and Fittings:** J. BLIJR [Circuit breakers] 9,426/12.

**Incandescent Lamps:** WESTINGHOUSE METALLFADEN GLUHLAMPEN-FABRIK [Manufacture of tungsten] 3,162/13.

**Telephony and Telegraphy:** SIEMENS & HALSKE AKT. GES. [Semi-automatic telephony] 6,936/13.

### Opposition to Grant of Patents

1,915/13. **Manufacture of Tungsten.** B.T.-H. Co. The grant of this patent has been allowed by the Comptroller.

### Amendments

12,082/13. **Arc Lamps.** H. AYRTON. Application has been made for leave to correct this specification.

25,591/13. **Duplex Telegraphy.** EASTERN TELEGRAPH CO. and RYAN. The above specification has been corrected.

### Expired Patents

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** M. WITTGENSTEINER [Feed mechanism] 7,508/09.

**Distributing Systems, Cables and Wires, Insulating Materials, &c:** A. H. JACKSON [Motor control] 7,335/08; A. G. BROOKES (*Thomas & Betts Co.*) [Cable coupling] 7,576/09; W. SCHMAHL and AMORDUCT MFG. CO. [Armouring] 7,706/09; R. K. GRAY [Submarine cables] 7,791/09.

**Dynamos, Motors and Transformers:** M. MILCH [Field regulation] 7,919/06; B.T.-H. Co. and F. H. CLOUGH [Dynamo windings] 7,327/08.

**Electrochemistry and Electrometallurgy:** A. G. BEITS [Lead refining with fluoric electrolyte] 7,661/02.

**Ignition:** A. ZÄBRINGER [Distributing switch for magnetos] 7,014/08.

**Telephony and Telegraphy:** J. SCHLISSLER [High-frequency oscillator] 7,028/08; [Wireless telephony] 4,026/09; [Magnetically-controlled condenser] 4,028/09; W. BURSTYN [Wireless telephony] 7,906/09.

**Traction:** H. PIEPER [Petrol-electric vehicles] 7,526/04.

**Miscellaneous:** J. GARDNER [Controlling apparatus by sound] 7,654/06; A. J. BOULT (*O. Patin*) [Water purifier] 6,949/08; W. E. LAKE (*Electrelle Co.*) [Musical instruments] 7,233/08; P. G. SHILSTON [Signalling lamp] 7,300/08.

## ELECTRIC TRACTION NOTES

In one of the Papers read before the Congress of the Tramways and Light Railways Association at Newcastle, Mr. H. M. Sayers detailed some experiences in tramway construction in Brazil, and gave some interesting particulars of the special circumstances and difficulties which arose during the reconstruction of the tramways at Santos. The problem was complicated by the necessity for keeping the old mule routes at work during the reconstruction and alterations in the requirements of the local authorities. On certain parts of the routes, cross-wood sleepers were employed, with Vignoles rails on the beach and other lines and grooved rails in the paved streets. Concrete stringer construction was used in the older and central streets, as no alternative method was agreed to. There was, however, some trouble with transverse fracture of stringers, which Mr. Sayers considers unavoidable where anchor plates are used at rail joints, and there are violent changes in the temperature. Rail expansion gave a good deal of movement of the track on the unpaved roads, and on short radius curves the lateral shifting was as much as four inches between night and day. There was no difficulty in running the same cars on the Vignoles and grooved rails. The tramway poles also carried telephone and other wires, and a good deal of trouble was experienced with storms causing the telephone wires to fall across the others. A considerable amount of goods traffic is handled with motor and trailer waggons of 4 and 6 tons capacity.

Another Paper, by Mr. F. Bland, on "Standard Tramway Rails," contained a comparison between English and foreign sections. The difference in  $\frac{1}{4}$  in. in the depth of the groove between the Continental and English standard rails was noticed, although the running treads were practically the same. America has now standardised four sections, after six years' consideration, but these have not yet been put into practice. Mr. R. Humphries also read a Paper on rail joints. He described various forms of joint, and classified them as follows:—Fish-plated joints, with or without base supports; welded joints without fish-plates; and welded joints with fish-plates. He had no hesitation in advocating the last, and described the electric welding equipment used on the Birmingham and Midland Tramways. A motor-generator is carried on a special car, and arc welding is used for filling in dished joints and welding the fishplates to the rail. The conductivity of the joint is improved, and bonds can be abolished. Descriptions were also given in the Paper of the well-known Thermit and cast-welding methods. It was stated that great care and skill were necessary with both of these, while an objection to the latter was the elaborate equipment required. In another joint a shoe is welded by the oxy-acetylene process to the base of the rail. The Tudor Accumulator Co. have developed a method of "quasi-arc" welding, in which they use an electrode of Swedish iron coated with slag. In addition to welding fish-plates they have a machine for welding a strip of metal on the tread of the rails. The Lorain Steel Co. have an electric butt welding system of rail jointing, but this requires a plant occupying no less than five cars. Welding currents at as much as 25,000 amperes at 5 volts are used.

In calling attention at the last meeting of the Corporation to the large deficit of £14,421 upon the West Ham Corporation Tramways last year (referred to in our last issue), the Chairman of the Tramways Committee mentioned that the cost of track maintenance was no less than £22,035, as against £14,061 and £8,799 in the two preceding years. This expenditure was largely brought about by exceptional vehicular traffic, and the unrestricted use of the tramway tracks needed, he said, the earnest and serious attention of the Council. It is proposed to call upon the rates for £10,000 of the deficit and charge the remainder to reserve. In doing so, it should be pointed out that the undertaking has already contributed £35,740 from profits in relief of rates, in addition to some £33,081 by way of rates under the ordinary assessment.

Under the Standing Orders of the L.C.C., schemes for new tramways must be presented before the summer recess. The Highways Committee are asking for the suspension of these Standing Orders, to bring up in the autumn a scheme for abolishing a number of dead ends and generally linking-up, at a cost of about £1,000,000. Already the views of M. Mariage, the Paris tramway and omnibus expert, have been obtained, and it is in order to consider these more fully that the suspension of the Standing Order is sought.

The Bill of the London Brighton & South Coast Railway Co., which was before a House of Commons Committee last week, dealt, among other things, with the provision of electrical energy for dealing with the Co.'s projected 200 miles of new electric railways. Power was taken under the Bill to enter into agreements with the County of London Electric Supply Corporation, but the London County Council opposed, on the ground that these agreements would carry beyond 1931, the date when the L.C.C. may purchase the London supply companies. Eventually it was decided that any agreements entered into between the Railway Co. and the Supply Co. should be submitted to the L.C.C. for consent, so far as they relate to the period subsequent to 1931. Opposition was also offered to the Bill by the Croydon Corporation, and in this case the Committee's decision was that any current supplied by the London Electric Supply Corporation to the Railway Co. should only be used in Croydon for purely railway purposes, and not to any premises which the Company might own and let.

In answer to a question in the House of Commons last week, it was stated on behalf of the Postmaster-General that tenders will shortly be invited for the construction of the tunnel for the new Post Office underground electric railway. An experimental track has been constructed on War Office property with a view to carrying out certain tests.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The following Committee has been appointed to consider the organisation of the telegraph service, and to report as to the improvement of its efficiency and economy:—Sir Archibald Williamson, Bt., M.P. (Chairman); Sir Henry Norman, M.P.; Sir Charles Stewart-Wilson, K.C.I.E.; Sir William Plender; and Mr. A. M. Ogilvie, C.B.

With regard to the recent Press notices concerning a contract between Marconi's Wireless Telegraph Works and the Chinese Government, it is officially stated that negotiations have been pending between the parties for some time for the erection of a number of wireless stations in China for internal and external services. The Company has every confidence that in due course an agreement will be signed.

A circular has been issued by six Irish shareholders of Marconi's Wireless Telegraph Co. criticising the report for the past year, given in our last issue. Complaint is made that the report does not show what profit, if any, is made by the sending of messages, and the contract for the Imperial wireless scheme is regarded as not having proved a success. A number of other details are dealt with in the circular, and shareholders are invited to communicate with Mr. E. F. Sheils, Dame House, Dame Street, Dublin.

At the annual meeting of Marconi's Wireless Telegraph Co. on Tuesday, Mr. Marconi, the Chairman, and Mr. Godfrey Isaacs, the Managing Director, although not on the list to retire, did so, "in view of the extraordinarily false rumours which are constantly circulated, and of the poisoned atmosphere by which," said Mr. Isaacs, "I have been recently surrounded." In the subsequent voting the Chairman was unanimously re-elected, and Mr. Isaacs was also re-elected with but one or two dissentients. The report and balance-sheet were adopted; an amendment to adjourn the consideration of them until a proper and detailed balance-sheet, and trading, and profit and loss account were submitted to the shareholders was not seconded. The general tone of the meeting was to deprecate any attack upon the Board in view of the work which has been accomplished.

In answer to a question in the House of Commons on Tuesday it was stated that no application has been made by Marconi's Wireless Telegraph Co. for a renewal of Patent 7,777, which expired, after the normal life of fourteen years, on April 26th. Questions were also asked as to whether the Government could claim compensation with regard to this expiry under the Imperial wireless telegraph scheme, but the reply was that all such matters were dealt with under the agreement.

The cable between St. Jacques and Doson failed on the 17th inst., and telegrams are being sent by land-line, subject to delay.—The land-line between Behbahan and Ahvaz was down beyond the former place on the 20th inst.—The Scutari, Lesh, s'Giovanni di Medua, and Vallona offices only are transacting international business, and telegrams for Durazzo can only be accepted at senders' risk.—Telegrams for other places in Albania cannot be sent at the moment.



## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 425. —

### HALF-WATT LAMPS: NEW SIZES AND PRICES

ON Monday five new sizes of "half-watt" lamps were put on the market in this country, and prices were also considerably reduced. The new sizes are:—200 to 255 volts, 500 watts; 100 to 130 volts, 200 and 300 watts; and 50 to 65 volts, 100 and 200 watts.

25 volts, 50-watt 100 c.p. and 100-watt 200 c.p. are also in use in Germany, and may possibly find their way to England for those cases in which 25 volts was adopted when the metal filament lamp was first introduced. In Germany, also, as mentioned in our columns recently, 14-volt lamps of 50, 100, and 200 c.p. (25, 50, and 100 watts) are also on the market for use with small lamp-holder transformers on A.C. systems. For



FIG. 1.—OSRAM 210-VOLT 500-WATT LAMP.

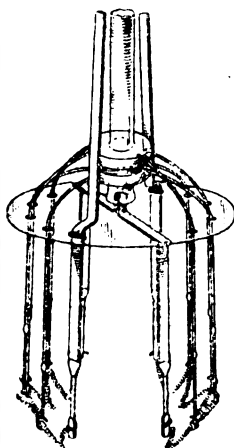


FIG. 2.—FILAMENT OF 200 V. 500 W. OSRAM LAMP, ABOUT 2/3 SCALE.

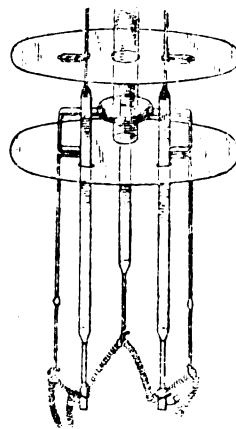
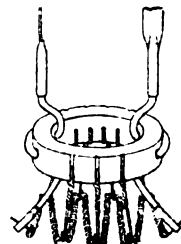
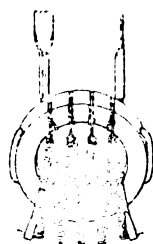


FIG. 3.—FILAMENT OF 100 V. 1,000 W. OSRAM LAMP, ABOUT 2/3 SCALE.



FIGS. 4 AND 5.—FILAMENT AND ATTACHMENT OF OSRAM "VERTICAL" AND "HORIZONTAL" PROJECTOR LAMPS. FULL SIZE.

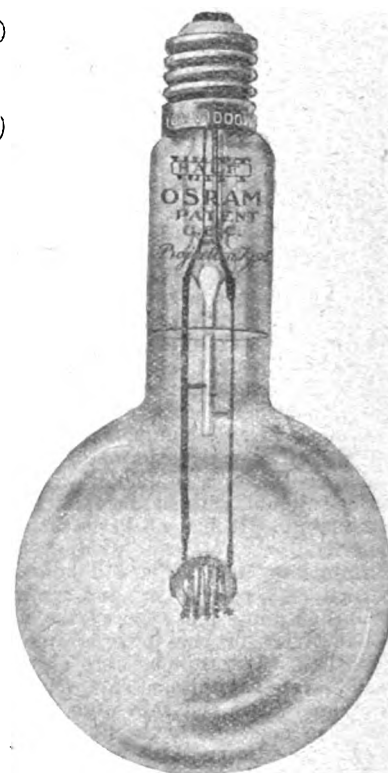


FIG. 6.—OSRAM 100-VOLT 1,000-WATT "VERTICAL" PROJECTOR LAMP. ABOUT 1/2 SIZE.

The whole range of half-watt lamps now obtainable is as follows:—

Voltage.	Watts.	Old List Price.	New List Price.
200 to 255	500	—	30s.
200 to 255	1000	50s.	40s.
"	1500	60s.	50s.
100 to 130	200	—	20s.
"	300	—	25s.
200 to 255	500	35s.	30s.
"	1000	50s.	40s.
"	1500	60s.	50s.
50 to 65	100	—	15s.
"	200	—	20s.
50 to 65	300	30s.	25s.
"	500	35s.	30s.

The new sizes are printed in heavier type. In all cases the candle-powers (Hefner) are twice the wattages.

The lamps rated at 300 watts and over are supplied with "Goliath" caps, and the smaller sizes with standard Edison screw caps.

It is probable that lamps of 300 watts (600 c.p.) for voltages between 200 and 230 will also be obtainable shortly (although these are not yet officially announced), as this size is on the market abroad, and the same remark applies to 150-watt lamps at 100 to 130 volts. On installations with transformers reducing to

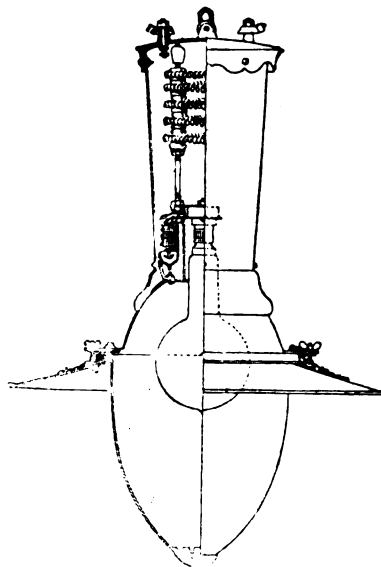


FIG. 7.—OSRAM HALF-WATT LANTERN FOR SERIES CIRCUITS.

motor-car head-lamps, half-watt lamps of 50 and 100 c.p. are also on the German market, the former in 6 and 8 volt sizes and the latter for 6, 8, 10, or 12 volts.

Another welcome step in the progress of the half-watt lamp is the introduction of special half-watt lamps for projection purposes. These are made with the filament spirals very close together. Focusing lamps of this type are listed at present only in voltages between 100 and 130 and for 300, 500, 1,000, and 1,500

watts. The 1,500-watt (3,000 c.p.) size is suitable for small cinematographs with a picture 10 ft. in diameter, and the other sizes will be found useful for magic lanterns, photographic enlarging, &c. These lamps are obtainable both with filaments parallel to and at right angles to the axis of the lamp.

We have received detailed particulars from a number of firms:—

#### Osram Half-watt Lamps.

The new 200 to 255-volt 500-watt lamp is illustrated in Fig. 1, which is a little less than half actual size; the diameter

and hood for series running (in place of arc lamps) with self-contained automatic cut-out and substitutional resistance. This is made in 300, 500, and 1,000-watt sizes; a distribution curve for the 1,000-watt size sent us shows a maximum candle-power of about 2,500 vertically below the lantern, increasing gradually to the maximum of about 3,100 at 60 deg., and then falling back to about 2,500 at 75 deg.—a most useful shape of illumination curve for lighting streets and open spaces. The General Electric Co. inform us that experience with the  $\frac{1}{2}$ -watt lamps which have been on the market since January is that the stated average life of 1,000 hours has been well maintained, and they have sent us copies of testimonials from users which bear this out.

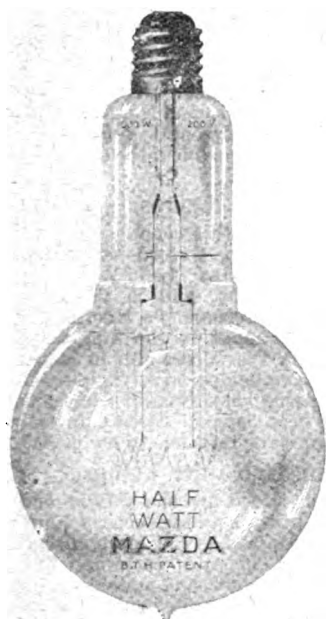


FIG. 8.—MAZDA 200 v. 1,000 w. LAMP. ABOUT  $\frac{1}{2}$  SIZE.

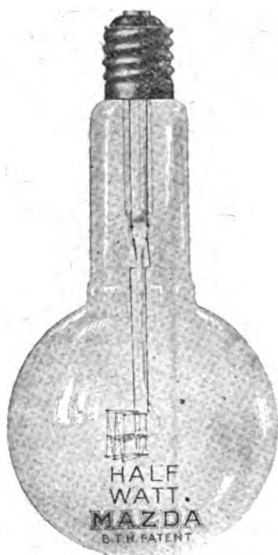


FIG. 9.—MAZDA 100 v. 500 w. PROJECTOR LAMP.

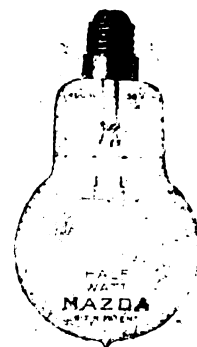


FIG. 10.—MAZDA 50 v. 100 w. LAMP. ABOUT  $\frac{1}{2}$  SIZE.



FIG. 11.—WOTAN 50-65 v. 100-WATT LAMP. ABOUT  $\frac{1}{2}$  SIZE.

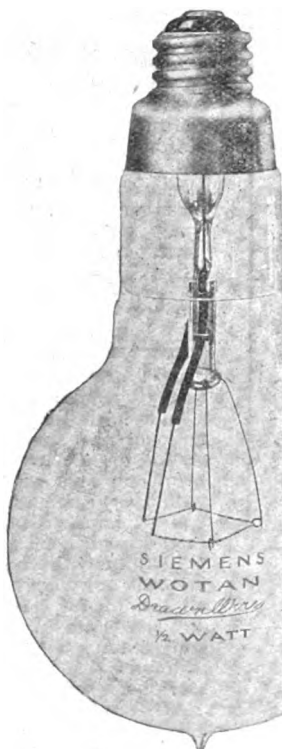


FIG. 12.—WOTAN 100-130 v. 200-WATT LAMP. ABOUT  $\frac{1}{2}$  SIZE.

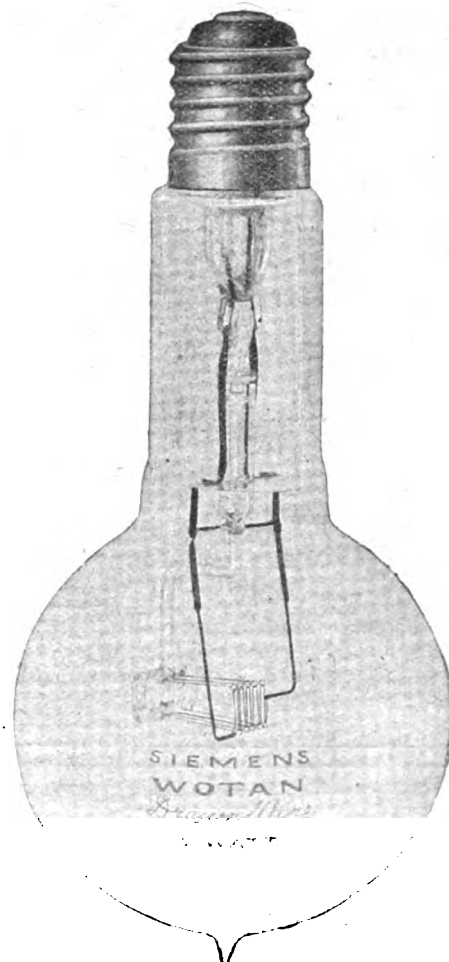


FIG. 13.—WOTAN 1,000-WATT PROJECTOR LAMP. ABOUT  $\frac{1}{2}$  SIZE.

of the bulb is 6 ins. Fig. 2 shows the filament on a larger scale. Fig. 6 is a 100-volt 1,000-watt projector lamp of the "vertical" type; Figs. 4 and 5 depict the filaments of these projector lamps and their method of attachment to larger scale, showing how the filament spirals are arranged close together on one plane in both the "horizontal" and "vertical" types, and Fig. 3, drawn from an ordinary  $\frac{1}{2}$ -watt 100-volt 1,000-watt lamp, enables a comparison to be made. The bulbs of the projector lamps are considerably smaller than those of the ordinary  $\frac{1}{2}$ -watt lamps of the same wattage. Another interesting illustration is Fig. 7, which is a  $\frac{1}{2}$ -watt lamp arranged in a lantern

#### Mazda Half-watt Lamps.

The list of Mazda half-watt lamps, including the new sizes and prices, which has just been issued by the British Thomson-Houston Co., has on its cover a fine reproduction of an untouched photograph showing the Leeds City Square lighted by Mazda half-watt lamps, and the company informs us that their half-watt lamps are everywhere replacing other forms of high candle-power units. They have sent us the three illustrations above of the new sizes. Fig. 8 is a 1,000-watt 200-volt lamp, about  $\frac{1}{2}$  size; Fig. 9 shows their form of projector lamp (which may also be had with horizontal filament), and Fig. 10 a 50-volt

# ELECTRICIANS !



Have you seen  
**Moseley's** latest  
**Rubber Gloves ?** production in

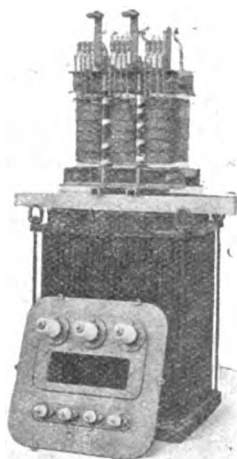
**THEY ARE ABSOLUTELY THE BEST.**

You cannot afford to run risks, and should use  
the best glove that can be made.

Write for particulars. Samples sent on approval.

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## SMIT TRANSFORMERS



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# CRANES

**MONEY  
SAVING  
LINES**

WRITE  
FOR  
LISTS

**CENTRAL  
DEPOT  
22 NEWHALL HILL.**

"ENAMELOID" "BRASSOLINE"  
"ZAPON" ENAMEL  
"ZAPON" GOLD DYE PROCESS  
CELLULOID SPRAY ENAMELS  
SPRAYERS  
ETC.

**COLD  
LACQUERS**

**FREDK  
CRANE  
CHEMICAL  
CO.  
BORDSELEY  
GREEN.  
BIRMINGHAM.**

100-watt lamp. It will be noticed that the 100 and 200-watt lamps, compared with the ordinary tungsten lamps of the same wattage and half the candle-power, are actually of smaller dimensions, and will therefore find much favour for interior lighting in cases where the voltages are suitable. We are asked to state that full information with regard to Mazda half-watt lamps and fittings may be obtained at the company's lamp and supplies department at 77 Upper Thames Street, London, E.C.

### Wotan Half-watt Lamps.

Three of the Wotan half-watt lamps are illustrated on p. 423, and the makers, Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston), call our attention particularly to the small sizes of the bulbs. Fig. 12 shows the 100 to 130-volt 200-watt lamp, which is only 4 ins. in diameter. The 50 to 65-volt 100-watt lamp (Fig. 11) is of the same diameter, but only 6½ ins. long. Fig. 13 shows the Wotan projector lamp, with vertical filament; a similar lamp is made with horizontal filament. The makers expect a good demand for the former for outside shop lighting, and the horizontal type for theatre auditoriums and similar positions in which the light is placed high above the floor.

### Nitra Half-watt Lamps.

The Nitra half-watt lamp, sold in this country by the A.E.G. Electric Co., Ltd. (Pembroke House, Oxford Street), and the Electrical Co., Ltd. (122 Charing Cross Road, W.C.), is manufactured by the German A.E.G. Co., and is the outcome of extended experimental work in the company's laboratories. The sizes are the same as those mentioned in the first part of this article on p. 422, and the firm specialises also in standardised reflector fittings. All the Nitra lamps have "pipless" bulbs. A compact and useful list, giving very detailed dimensions both of lamps and lanterns, has been issued. Recent investigations in connection with these lamps are referred to on p. 417.

### Royal Ediswan Half-watt Lamps.

An attractive list has been issued by the Edison and Swan United Electric Light Co., Ltd., showing clearly the alterations in prices and the new sizes, and giving particulars also of the Goliath E.S. lamp-holders in two patterns, light and heavy; the former is of stamped brass, and suitable for interior use, and the latter is of heavy cast brass, substantially made and extra well finished, so that it is essentially the holder for exposed positions.

### Drake & Gorham.

Drake and Gorham, Ltd. (1 Felix Street, Westminster, S.W.), inform us that they have put in enormous stocks of half-watt lamps in anticipation of a large demand, and can guarantee delivery with their usual promptitude. They stock Osram, Mazda, Wotan, Ediswan, and Nitra lamps in all the voltages and wattages mentioned. For Osram half-watt lamps their terms of discount are the same as for standard Osram lamps; for other makes a preferential 7½ per cent. is given.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**ROTARY CONVERTERS.**—The General Electric Company, Ltd. (67 Queen Victoria Street, London, E.C.), have just issued a bulletin dealing with "Witton" rotary converters. The treatment of the subject is divided into three sections. The first section gives particulars of the construction, and is illustrated by photographs of the more interesting details. Section 2 deals with the general principles upon which the converters depend, and explains, without being too highly technical, the various factors which enter into the design. The third section deals very fully with the control of rotary converters. The various methods of voltage regulating, of starting and self-synchronising, all come in for treatment under this head. The fourth and last section relates to the operation of rotary converter sub-stations, and contains a good deal of useful information. There can be no doubt that any engineer who has to deal with this class of machinery will find this publication worth perusal.

**AUTOMOBILE AND BATTERY LAMPS.**—The British Thomson-Houston Co. (Mazda House, 77 Upper Thames Street, E.C.), have just issued a new price list of Mazda drawn wire automobile, battery, and flashlight lamps. This list comprises in the automobile section, head-light, side-light, tail-light, and steering pillar light lamps, and dome-light, festoon, and tubular lamps for interior lighting. A noteworthy feature is the inclusion of specially capped lamps for American cars. An important characteristic of these lamps is the helical coil or spiralled filament used in the head-light lamps, which gives a closer focus than can be obtained with any other practicable form of lamp. The list contains particulars of a number of miscellaneous types for battery service, such as motor-bus lamps, common battery lamps, illumination lamps, &c. Mazda flashlight lamps, both plain and opal back, are also listed at the reduced prices, and are now 6d. and 7d. respectively.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—The Sydney Corporation requires 22,500 yds. of 33,000-volt three-core paper-insulated lead-covered cable. Copy of the specification may be seen at 73 Basinghall Street, E.C. Tenders by September 14th.

**Blackrock.**—Messrs. May and Hawes are reporting to the Council with regard to their electric lighting scheme.

**China.**—Electrical plant for the Tientsin Mint. Consulting Engineers, Sir Douglas Fox and Partners, 56 Moorgate Street, E.C. Tenders to Dr. Chen-Chin-Tao, Financial Commissioner, Chinese Legation, 49 Portland Place, W.

**Dublin.**—A loan of £80,300 for extensions to the electrical undertaking has been sanctioned. Of this sum £2,500 is to be expended on the conversion of public gas lighting into electric lighting. Originally the Corporation applied for £5,000 for public lighting, but this has been halved at the suggestion of the inspector.

**Edinburgh.**—The Secretary for Scotland has sanctioned the borrowing of £220,000 for electrical extensions.

**Grimsby.**—The Borough Electrical Engineer advises the installation of a new battery, switchgear, &c., at an estimated cost of £5,000. The carrying out of this scheme is urged upon the Corporation, as there is at present considerable risk of interruption in the supply.

**Hayle.**—An electric lighting scheme is under consideration. Power will in all probability be taken from the Cornwall Electric Power Co.

**London: Islington.**—A loan of £5,316 is recommended by the Finance Committee of the L.C.C. for additional cooling towers.

**New Zealand.**—An expenditure of £4,000 upon extensions to the electric lighting undertaking at Wairoa has been sanctioned.

**Rochdale.**—Twelve months' supply of paper-insulated cables. Borough Electrical Engineer. August 5th.

**Walsall.**—The Local Government Board has approved generally of the new power station, and has authorised the commencement immediately of urgent works.

### Wiring

**Hull.**—Tenders are invited for electrical fittings for the Council Chamber at the Guildhall. Town Clerk. August 22nd.

**Wisbech.**—Tenders are invited for the electric lighting of the workhouse. Clerk to Guardians, Union Offices, 2 Ely Place.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Arbroath.**—Building for Prudential Assurance Co.

**Brighton.**—Municipal concert hall (£25,000).

**Bristol.**—School at St. Philip's Marsh.

**Hastings.**—New hospital.

**Liverpool.**—New police courts.

**London.**—It is proposed to spend £350,000 on a new City Hall for Westminster.

**Portsmouth.**—Hospital for consumptives.

**Swansea.**—Five hundred houses. Town Clerk.

### Miscellaneous

**Canada.**—Tenders for the supply of 23 nauts of single-conductor submarine telegraph cable, to be delivered at Halifax, N.S., within eight weeks of ordering, and also for 14 knots of the same material, to be delivered at Vancouver, B.C., are required by the Department of Public Works, Ottawa. Copy of the specification may be seen at 73 Basinghall Street, E.C.

**South Africa.**—Tenders are invited for the supply of twenty-two electric motors of various sizes for the Salt River workshops of the South African Railways Administration. Further particulars at 73 Basinghall Street, E.C.

**Works Outing.**—The annual picnic of the Synchronome Co., Ltd., took place on Saturday last. The party, thirty in number, embarked at Windsor on the launch *Duchess* and visited Quarry Woods, Marlow, Bispham Abbey, and Temple Lock. Mr. Hope-Jones took an active part in the proceedings.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Harrogate.**—The tender of Goodbrand & Co. for a 288-pipe economiser has been accepted.

**London: L.C.C.**—The tender of G. Robson & Co. at £288 has been accepted for the supply of four portable electrically-driven drilling and grinding machines.

The following tenders have been received for 150 sets of plough collector gear:—British Westinghouse Co., £7 17s. 6d. per set; Brush Electrical Engineering Co., £7 19s. per set; Spagnoletti, £10 5s. per set; Estler Bros., £11 per set; Siemens Bros. Dynamo Works, £12 2s. 6d. per set. The first-named tender has been accepted at a total cost of £1,181 5s.

The tender of Drysdale & Co., at £178 12s. 6d., has been accepted for an electrically-driven vertical drainage pump. The Rees Roturbo Manufacturing Co. quoted £212, and the British Electric Plant Co. sent in an incomplete tender.

**Hackney.**—The following tenders have been received for 80,000 pairs of open-type white arc-lamp carbons:—The General Electric Co., 40,000 pairs at 70s. per 1,000, and 40,000 pairs at 60s. per 1,000; Henrion Carbons, Ltd., 68s. 11d. per 1,000 and 57s. 8d. per 1,000 respectively; H. Tuckman, 68s. per 1,000 and 57s. 6d. per 1,000. In view of the slight difference between the English and foreign prices, the Committee recommend the acceptance of the General Electric Co.'s tender. The highest price is for 18 mm. by 12½ in. cored carbons, and 13 mm. by 11½ in. solid carbons, whilst the lowest price is for 18 mm. by 10½ in. cored carbons, and 13 mm. by 9½ in. solid carbons.

The following tenders were received for 100,000 pairs of yellow flame arc-lamp carbons:—The General Electric Co., 62s. 6d. per 1,000; Electrical Co., 61s. 6d. per 1,000; Sloan Electrical Co., 60s. 6d. per 1,000; Ship Carbons, Ltd., 57s. per 1,000; W. Geipel & Co., 51s. per 1,000. In this case the Committee point out that the English carbons are so much higher in price that there is no reason to look beyond the lowest tender, viz., W. Geipel & Co., and this is recommended for acceptance.

Tenders were also invited for special higher grade carbons, but the prices are regarded as out of all proportion to the difference to which their use could make to the public lighting, and no recommendation is made with regard to these tenders.

**Stoke-on-Trent.**—The tender of Chamberlain & Hookham has been accepted for meters.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £62 15s. to £63 5s. (Last week, £63 5s. to £63 15s.)

**Canadian Agency.**—An electrical engineer at Montreal desires to get into touch with British manufacturers of steam turbines and high-speed electric generating sets, &c. Further particulars at 12 Victoria Street, S.W.

**Agency.**—Morris & Lister (London), Ltd. (8 and 4 Palace Chambers, Bridge Street, Westminster, S.W.), have now taken over the sole representation for London and the south of England for Mickelwright, Ltd., of Alpertown, in place of Mr. Raymond Smith, the late representative.

**Changes of Address.**—The Reliance Electrical Wire Co. (36 Spital Square, E.C.) have removed to Spitalfields Works, 38 and 40 Curtain Road, E.C.

Mr. C. H. Jeffcoat has removed to 18 Ranelagh Gardens, Chiswick, where inquiries for "Lamlok" specialities should be addressed.

**Works Holiday.**—We have received notice of closing of the following works for summer holidays:—A. P. Lundberg & Sons (477-489 Liverpool Road, N.), July 31st to August 10th; London Electric Firm (George Street, Croydon), August 1st to August 10th; J. H. Tucker & Co. (King's Road, Hay Mills, Birmingham), the whole of Bank Holiday week for the works, but offices and warehouse will re-open on the Wednesday; Western Electric Co., August 1st to August 10th; Liverpool Electric Cable Co., August 1st to August 10th.



**Reduction in Cable Prices.**—We regret that two inaccuracies occurred in the note on this subject on page 413 of our last issue. The discount on Henley's C.M.A. and Association flexibles, 2,500 megohm grade, should have been 33½ and not 33 per cent., and the special price for 3/22 non-Association Class W cable should have been £7 15s. instead of £9 15s.

**Agency.**—A firm of electric sign manufacturers in New Jersey desires to get into communication with United Kingdom makers of miniature metal-filament lamps; about 100,000 required. Further particulars at 73 Basinghall Street, E.C.

**Dissolution of Partnership.**—H. C. Barlow and H. A. Jackson, trading as H. C. Barlow & Co., 52 Chapel Street, Salford, have dissolved partnership. All debts will be paid by H. C. Barlow, who will carry on business at the above address.

## LOCAL NOTES

**Aldershot: Proposed Cooling Tower.**—A proposal by the Borough Electrical Engineer to erect a cooling tower at the electricity works, at an estimated cost of £400, met with considerable opposition at the last meeting of the Corporation, and eventually the matter was taken back by the Committee for further consideration. It was suggested by one member of the Council that a water tower is unnecessary, and that the same result could be effected by other means at a quarter the cost.

**Blackburn: Electrical Section to Chamber of Commerce.**—It has been decided to form an electrical section of the Blackburn Chamber of Commerce. Already several electrical firms are members of the Chamber, and the general body of the membership has passed a resolution agreeing to the new section. It may be mentioned that the Newcastle Chamber of Commerce has had an electrical section for some time.

**Bradford: Relief of Rates.**—Out of the net profit of £14,900 on the electricity undertaking last year, £5,000 have been contributed to relief of rates, £7,000 to expenditure of a capital nature, and the balance of £2,900 has been carried to reserve and renewals. The revenue for the year increased by £14,000, and the total number of units sold was 28,000,000, against 24,500,000 in the previous twelve months.

**Bristol: Satisfactory Progress of Electricity Undertaking.**—The annual report of Mr. H. Faraday Proctor, the General Manager of the Corporation's electricity undertaking, shows an exceedingly good result for the past year. The net profit amounted to £8,516, to which is added the balance of £2,411 from last year, making a total of £10,927. Of this £6,000 have been transferred to general reserve, new meters for renewals absorb £526, the final payment for the three-phase alternator at Avonbank takes £366, new meters on new connections cost £1,198, and wages of permanent workmen engaged on capital work not chargeable to loan account, &c., absorb a sum making a total of £8,613, leaving a balance of £2,314 to be carried forward. The year's accounts also take into consideration the reduction of £2,000 in the annual charge for public street lighting. There was a most gratifying increase in the general development, and the number of units sold increased by nearly 2½ millions, which, Mr. Proctor points out, taken in conjunction with the increase in the preceding year, shows a growth in the business of the undertaking of 50 per cent. during the past two years.

**Darwen: Electricity Accounts.**—The net profit on the electricity undertaking for last year was £972, against £912 in the previous year. This sum, however, remains after paying £1,000 to relief of rates, £70 to meeting the cost of switchboard improvements, and a further £500 in aid of the rates for the current year.

**Keighley: Electricity Profits.**—For the first time during its thirteen years' existence, the electricity undertaking shows a profit for last year running into four figures, viz., £1,200.

**London: St. Pancras: Large Electricity Profits.**—There was a net profit of £12,567 upon the electricity undertaking last year, to which is added the balance of £4,522 from the previous twelve months, making the credit of net revenue account £17,090. The sum of £4,000 is to be retained as working balance; the reserve fund now stands at £44,033, of which £30,610 is represented by loans advanced to the electricity capital account.

**Oldham: Electricity Accounts.**—The report for the past year of the late Mr. S. W. Newington, Borough Electrical Engineer, shows a net profit of £1,995, after meeting capital charges, and £1,215 expenditure on meters. This balance is

to be carried forward. Two G.E.C. 500-kw. motor-generators were put into commission on January 1st this year for the purpose of supplying extra high-tension A.C. current, and further tenders have been accepted for an extra high-tension A.C. switchboard and a 2,000-kw. high-pressure turbo-alternator and condensing plant, in order to meet the increasing demands upon the undertaking. The net profit is an improvement on that of the previous twelve months, when the amount was £1,044.

**Southampton: Electric Car.**—The Committee recommend the provision of an electric car for the use of the Borough Electrical Engineer. The Department propose to build this themselves, purchasing a chassis.

**Surbiton: Future of Electricity Undertaking.**—Under the present arrangement by which Callender's Cable & Construction Co. work the electricity undertaking on behalf of the Council, there is a loss of £360 per annum. A Sub-Committee which has been advised by Sir John Snell recommends the transfer of the undertaking to Callender's. The terms proposed are similar to those sanctioned by the Board of Trade in connection with the transfer of the Frome electricity undertaking to Edmundson's Electricity Corporation, and provide practically for a lease of the undertaking for forty-two years, at the end of which time the Council has the option to purchase. Messrs. Callender's will repay the deficit which has been incurred, in addition to paying off the debt charges, and will further pay the salary (fifty guineas per annum) of the consulting engineer whom the Council may appoint to watch over its interests. A recommendation to this effect was sanctioned at the last meeting of the Council.

**West Ham: Electricity Profits.**—In reporting a net profit of £751 on the electricity undertaking last year, Mr. J. W. Beauchamp, the Borough Electrical Engineer, calls attention to the fact that this is arrived at after meeting £7,550 increased cost of fuel, an increase in local rating amounting to £4,368, the purchase of new meters out of revenue, £809, cost of repairs on certain plant £1,200, and the equipment of the repair shop at a cost of £550, making a total of £14,477 out of revenue. Another satisfactory feature of the year's working is that the turn-over represents an increase of 7,000,000 units, or 25 per cent. over the previous twelve months. This additional output has been obtained with quite a moderate increase in the maximum demand on the plant, this resulting in an important addition to the load-factor, which is reflected in the total cost per unit. Lighting connections show a steady advance, and the development in power connections continues to be well maintained. The use of electricity for cooking is also developing rapidly, a number of electric cooking equipments in the staff kitchens of the large power users having been supplied.

**Wolverhampton: Electrical Exhibition.**—A very successful exhibition which was visited by 50,000 persons has been held by the Electricity Department on the occasion of the Annual Floral Fête, in a large marquee. A seven-roomed model house was arranged to demonstrate domestic applications; two large laundry companies also exhibited, and electrically-driven sewing machines were shown by Messrs. Singer's. Cooking appliances by a number of firms was exemplified, and demonstrations were given. A special sub-station was established to supply the exhibition, and a distributor board for 77 circuits was put up by the Department in forty-eight hours. Over 4,000 lamps were used outside for illumination purposes. Mr. S. T. Allen (Chief Engineer) has sent us some photographs showing the very effective nature of some of the stands.

## APPOINTMENTS AND PERSONAL NOTES

The late Sir Joseph Swan, F.R.S., left estate of which the net personalty has been sworn at £58,344. His electric and laboratory apparatus and appliances are, under the will, to be presented to any person, institution, or corporation which his executors may select. The sum of £100 is bequeathed to the Royal Society for defraying the cost of scientific publication.

Mr. E. S. Smith, Superintendent of the Finishing Department of the United Electric Car Co., Preston, has been appointed Assistant Engineer to Messrs. J. G. White & Co., in Pernambuco.

An Assistant Electrical Engineer is required in the Gun Carriage Factory, Jubbulpore, India. Salary, 280 rising to 320 rupees per month. Director-General of Stores, India Office, W.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 396 [VOL. X., No. 31]  
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THURSDAY, JULY 30, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.  
Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 205-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circulating, Fleet, London." Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILGOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

**BANK HOLIDAY, August 3rd.**—Owing to our Offices being closed on this day, Advertisers are requested to send us any new "copy" or alterations to standing advertisements not later than first post Saturday.

## SUMMARY

WE give the details of the proposed central scheme for dealing with the supply of electricity in London. It is suggested that a Controlling Authority consisting of representatives of London and other boroughs around shall be formed, and that the actual work of centralising the supply of electricity would be placed in the hands of a new Company for a period of, say, fifty years, with full powers of control by the new Controlling Authority. (Page 428.)

AN interesting report by Dr. J. M. Beattie describes the apparatus for the electrical sterilisation of milk now successfully in use by the Liverpool Corporation and the experimental research work which led up to its establishment. (Page 429.)

A RECENT Paper read before the Royal Society by Sir Joseph Larmor and Mr. J. S. B. Larmor investigates the action of lightning conductors. (Page 429.)

AN illustrated article describes the arrangements for electrical driving at a wholesale chemist's factory. (Page 430.)

NOTES on the arrangements for the next session at some of the Universities and Technical Colleges are given on page 430.

A CURIOUS trouble on a motor circuit and the construction of electrolytic lightning arresters are dealt with in our Questions and Answers columns. (Page 431.)

THE specification for the "Coolidge" X-ray tubes was published last week.—Another specification published on the same date describes a system of wireless transmission invented by J. G. Balsillie.—Two B.T.-H. Co. patents for a motor-control system expire this week after a full life. (Page 432.)

TENDERS will shortly be invited for the supply of power for the Post Office tube railway.—The running of trailer and coupled cars on the L.C.C. northern tramway system is proposed.—The Hastings and District Electric Tramways Co. has been fined for having used the Dolter surface-contact system for three months beyond the time-limit allowed by the Board of Trade. (Page 433.)

MR. JUSTICE EVE has decided that the Helsby Wireless Telegraph Co. has infringed the Marconi Patent No. 7777 of 1900, which patent he has declared valid. There is to be an inquiry as to damages with costs against the Helsby Co.—The proposed agreement between the Board of Trade and Marconi's Wireless Telegraph Co. to be embodied in the Merchant Shipping (Convention) Bill has been abandoned, due to the protests by the shipping industry that they might have to pay monopoly prices for the apparatus under such an agreement.—Arrangements are being made for observations as to the effect of the solar eclipse on August 21st on wireless telegraph transmission. Five high-power stations, all using different frequencies, will send out special signals during the eclipse. (Page 433.)

A TRANSFORMER with an exceptionally low iron loss, which has been in satisfactory operation on the Continent for some time, is described in an illustrated article in our Trade Section, which also contains notes on various novelties. (Page 434.)

CONVERTING plant is required at Newport; an electrically-driven motor waggon at Belfast; a cooling tower at Birkenhead; a motor-generator at Oldham; and cable at Stalybridge.—8,000-kw. turbo-generators are to be substituted for the two remaining reciprocating engines at the Greenwich station of the L.C.C., and an expenditure of £18,500 is contemplated on cables.—Extensions are also to be carried out at Bristol (£42,000); Bury (£40,720); Farnworth (£3,400); Ilkley (£18,000); Wallasey (£64,500). (Page 437.)

THERE is an increase in the demand for hired electrical apparatus at Barrow-in-Furness.—The L.G.B. inspector has expressed himself unfavourably towards a proposal to pay the Redditch Borough Electrical Engineer a fee for acting as Resident Engineer in connection with extensions.—There was a net profit of ££8,677 on the Wolverhampton Electricity Department last year.—There was a considerable increase in the demand for electricity in Darlington last year. (Page 438.)

A 2 PER CENT. dividend is declared on the ordinary shares of the Yorkshire Electric Power Co., and 2½ per cent. by the Newcastle-on-Tyne Electric Supply Co. (Page 438.)

## FUTURE OF LONDON'S ELECTRICITY SUPPLY

### Unexpected Proposal by L.C.C. Committee.

THE Special Committee of the London County Council have, somewhat unexpectedly, already placed on paper their proposals for the concentration of London's electricity supply, and still more unexpectedly have put forward an entirely new policy. The first part of their proposal is obviously based on the correct principle, although possibly difficult of attainment. They intend that the three classes of electricity undertakings—viz., the fourteen companies which are purchasable on cheap terms by the L.C.C. in 1931, the fifteen undertakings which the Borough Councils can retain in perpetuity under the present law, and the various neighbouring company and municipal undertakings outside the County of London—should all be acquired by a new Controlling Authority, and combined on the lines suggested in Messrs. Merz and McLellan's report (*see ELECTRICAL ENGINEERING*, April 16th, 1914, p. 213.) It is the second part of the scheme that gives rise to some astonishment: namely, that the new undertaking thus formed should be leased to a company which is to provide part of the capital required for extensions, and this capital will apparently rank, so far as payment of interest and dividends are concerned, only after that provided by the Controlling Authority. The leasing company is to work under the general control of this Authority under certain definite restrictions, including the limitation of dividends.

On the method of bringing the new conditions into being, and the initial stages of procedure, the proposals are not very definite, and the Committee emphasise particularly that they have "aimed primarily at initiating a new policy rather than making any immediate revolutionary change in the *status quo*," and that the proposals which they submit are not intended to carry with them the "wholesale" scrapping of existing works. So far as it appears on the surface, however, no attempt has been made to ascertain whether the scheme would have the approval of the existing supply companies and the Borough Councils with electricity undertakings.

On the technical side of the question the Committee accept in their entirety the recommendations of Messrs. Merz & McLellan. The exact definition of the new area is not given, but it is stated that it will include portions of the areas of five other counties and three county boroughs in which there are thirty-nine municipal electricity undertakings and thirty-one companies. It is proposed that any powers of purchase by local authorities in the districts outside London should be transferred to the new authority, upon which the outer municipalities, as well as the London companies and L.C.C., would be represented.

The following are the details of the scheme:—

The leasing company, it is suggested, should at the outset be one which has control over a number of the existing undertakings, but "failing a sufficient number of existing companies coming forward it may be necessary to consider proposals by other bodies." With regard to finance, it is proposed that the Controlling Authority should advance by way of loan two-thirds of the capital required for fresh works, the remaining one-third being found by the company. All capital for the purchase of existing undertakings would be found by the Authority. A period of fifty years is suggested as the period of the lease to the new company, and the Controlling Authority would be empowered to resume possession after this period on repayment of the capital advanced by the company.

A technical committee consisting of a small number of engineering and financial experts, permanently appointed and paid for their services, is to be set up in the interests of the Controlling Authority, but emphasis is placed upon the necessity for preventing this control unduly hampering the company in its work. It is suggested that the Authority should exercise the following important powers of control:—(1) Approval of all proposals by the company involving capital expenditure. (2)

Approval of the nature of the capital raised by the company and of the terms on which that capital is raised. (3) During the last ten years of the lease, approval of all agreements and contracts entered into by the company. (4) A scale of maximum charges by the company for energy supplied, to be revised by the Board of Trade from time to time upon the application of either the Authority or the Company. (5) Powers to take action for the protection of the interests of retail and bulk consumers. (6) Such general controlling powers as are now possessed by the L.C.C. under the Electric Lighting Acts and the London Electric Supply Acts of 1908 and 1910, &c., to be transferred to the Authority, with certain necessary exceptions. (7) An auditor to be appointed by the Authority to act with one appointed by the Company.

No compulsory purchase of the Borough Council undertakings is entailed, and although it is regarded as in favour of the scheme that interference with existing undertakings will be reduced to a minimum, no recommendation is made in respect of those undertakings which the local authorities could refuse to lease or sell. This, however, is evidently provided for by the suggestions made for maintaining co-operation and interworking between the new company and the existing undertakers. In this portion of the scheme it is provided that local authorities who are authorised distributors in the area of supply are to be required to take from the new undertaking any additional power required by them, if it can be shown to the satisfaction of the Board of Trade that it would be more profitable for them to do so than to extend their own plant. Although the company is to be authorised to raise capital, it will not have power to charge the assets of the undertaking. A sinking fund is to be established, vested in the Authority, upon the basis of the capital expenditure in connection with the undertaking being written off as follows:—Land and engineering works, 60 years; cables, 40 years; power stations and sub-stations, with plant, 25 years; services, 12 years; interest paid out of capital, 30 years; purchase of existing undertakings, 30 years.

The net revenue from the undertaking is to be dealt with as follows:—(1) the payment of interest at 4 per cent. per annum on the proportion of capital found by the Authority; (2) the provision of a sinking fund to be owned by the Authority at the rate of about 2 per cent. per annum on the whole of the capital of the undertaking; (3) the payment of interest on the capital found by the Company at 4 per cent. per annum; (4) the provision of a reserve fund calculated at 1½ per cent. per annum on the whole of the capital of the undertaking; (5) the division of any surplus profits equally between the Authority and the Company until the Company receives a share sufficient to pay a further 4 per cent. interest upon its capital expenditure, making 8 per cent. in all. Of any profits beyond this, 75 per cent. is to be utilised in giving rebates to the consumers, and the remaining 25 per cent. is to be divided equally between the Authority and the Company.

The "Conclusion," with which the report terminates, almost suggests that the Committee anticipate that the scheme is still-born. They say:—

The keynote of the whole proposal is that it is an offer to the existing undertakings of a means of increasing the efficiency of their present undertakings, or, if they prefer it, an offer of a means of handing over their complete undertakings, upon terms to be agreed, to a central authority.

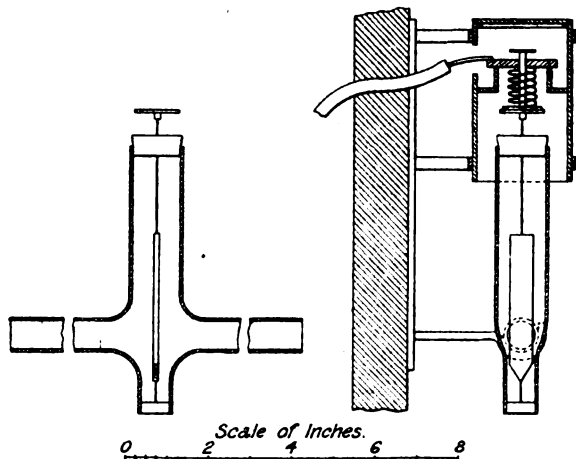
The precise details of the scheme, with a definite recommendation to the Council to promote legislation next session, are to be placed before the Council after the summer recess; the actual date proposed is November 3rd.

There was a long agenda to be got through at the meeting of the L.C.C. on Tuesday night, and (we believe by agreement beforehand) the reception of the Committee's report was also postponed to after the summer recess. As the Bill to give the Council the powers sought would have to be drafted early in November to enable it to come up for consideration next session, it is therefore questionable whether a Bill to give the Council the necessary powers can be drafted and deposited for this session. If it will be too late for this, the present report has brought us no nearer to the solution of the problem of the future of London's electricity supply.

## ELECTRICAL PURIFICATION OF MILK

**A**N interesting report by Dr. J. M. Beattie, City Bacteriologist at Liverpool, deals with the electrical treatment of milk, and describes a long course of laboratory research on the subject, and the large scale electrical milk treatment installation now in use at the Corporation Milk Dépôt in Earle Road, which was the outcome of those experiments.

The earliest experiments that were made by Mr. F. C. Lewis in the Thomson-Yales Laboratories of the Liverpool University consisted in passing unidirection currents through the milk, but it was found that not only was the required sterilisation not produced, but that undesirable changes were produced in the composition of the milk. Unidirection and slowly alternating currents were tried with milk to which minute quantities of salt had been added, but although this was successful from the sterilisation point of view, the milk was still spoiled from the consumer's point of view by the chemical changes in its constitution. In this method part of the salt is decomposed, as also is a part of the water, and an unstable body of high disinfecting power is produced. In subsequent experiments a rapidly alternating current was used with the addition of salt, and it was found that by this means the bacterial content of the milk could be reduced to a minimum, while the chemical constitution of the milk was apparently unimpaired. Although only in rare cases was the milk rendered absolutely sterile, it was freed from dangerous or disease-producing bacteria and from the ordinary milk-souring bacteria, and there was an enormous reduction in number of all other forms of bacterial life. The actual reduction was over 99 per cent. In the original experimental



SECTIONS OF ELECTRODE CHAMBER IN STERILISING TUBE.

apparatus a long glass tube was used, with three bulbs along its length, into which electrodes were sealed. The central electrode was connected to one pole of a transformer, and the two outer ones in parallel with the other pole, but in the improved form of the apparatus, upon which the design of the large permanent equipment was founded, separately constructed electrode chambers were used, connected up by rubber joints. A report by Mr. W. H. Roberts, City Analyst, confirms that the chemical composition of the milk is unaltered, and gives evidence of the non-increase of acidity and the improved keeping power of the milk. Mr. Roberts also states that the lactalbumin which is coagulated in ordinary sterilised milk is not coagulated in the electrically-treated milk, nor are the enzymes destroyed. Feeding experiments on kittens also demonstrated that the nutritive value of the milk is not impaired.

These experiments were so satisfactory that steps were at once taken to establish a larger plant at the Corporation Milk Dépôt, Earle Road, Liverpool. A large tank is provided, capable of holding a full day's supply of milk. This is connected with a smaller tank, in which the milk can be maintained at a constant level by a ball valve. From this the milk flows by gravity through the sterilising tube to receiving tank, from which it is conveyed to the bottling apparatus. The electrical apparatus consists of an alternator driven by a D.C. motor, a step-up transformer, and the necessary control gear. The transformer is kept in a fireproof chamber, and the sterilising tube is in a glass-fronted cupboard, interlocked with the switchgear, so that it cannot be opened when the current is on. The sterilising tube is provided with three electrode chambers, each supported in detachable brass claws fitted on to a brass back plate, through which the high-tension cable passes before it enters a vulcanite case,

in which it is connected to a spring terminating in a flat circular disc. The vulcanite case is covered by a vulcanite cap, and surrounds the upper part of the glass electrode chamber. This contains a nail-headed copper electrode, making contact with the spring disc. The arrangement is shown in the figure. These fittings are carried on a slate slab. For purposes of safety the milk passes through aluminium tubes before and after passing through the steriliser. These tubes, as well as certain other parts of the apparatus, are earthed. With the aluminium electrodes used at first trouble was sometimes experienced, due to flashing at the central electrode, especially when the rate of flow slowed down. This gave the milk a burnt taste, but this has been practically overcome by the use of copper electrodes. Small testing tanks are, however, provided, so that milk thus charred can be prevented from getting into the main supply. Exhaustive tests indicate equal success of this plant to that of the laboratory apparatus. The current used is slightly over 2 amperes at about 4,000 volts, and no undue heating effect is produced. Independent reports by Professors Delépine, Ritchie, and Sims Woodhead fully confirm Dr. Beattie's observations as to the improvement in keeping qualities and reduction in bacteria of all kinds, and the total suppression of *bacillus coli* and its allies.

## LIGHTNING PROTECTION

**A**N interesting study of lightning discharges and the effect of lightning conductor systems is contained in a Paper recently read before the Royal Society by Sir Joseph Larmor, F.R.S., and Mr. J. S. B. Larmor. The authors investigate the nature of the lightning discharge, and conceive of the flash commencing at some point in the field where, owing to the displacement of charged masses of the wind and by their mutual attractions, the limit of dielectric strength is reached, when a breakdown occurs and the disruption spreads along the line of force both backward and forward from this point of most intense force. In the case of a lightning rod they believe that the discharge starts at the summit of the rod, which is the point of most intense strain, and really strikes away from the rod and not towards it. The zigzag character of many flashes is due to the fact that the discharge profoundly alters the fields of force between the clouds and neighbouring masses, thus inciting immediate new discharges. Something of this kind is indicated by the discontinuous crackle of a sharp discharge. When once an ionised path is opened up, there is a strong tendency for subsequent discharges to take place along it. Sometimes the ionised line is blown into a new position by the wind, which may account for the frequently photographed parallel flashes. The authors then proceed to investigate the region of protection of a lightning rod by considering the modification of the field of force due to its influence. As a general principle it is the building to which the rod is attached that modifies the field and draws the charge by virtue of its conducting materials on account of its breadth being substantial compared to its height. The structure protects the region around its base by directing discharge to its own copper parts, which therefore need protection by conductors adequate to draw off the discharge to earth and vertical rods joined together if need be lower down, but rising from the corners of the structure to a height which need not be more than about half its breadth. The rods may rise from a network spread over the roof, and their essential feature appears to be their lifting the field of intenser force to the region in which their free ends are immersed. A lightning rod is most effective when it lies along the lines of force. Horizontal connecting rods are only of use when the charge is oblique.

**40,000-h.p. Turbo-alternator.**—The largest turbo set yet constructed on the Continent is now under test in the Mannheim works of the Brown, Boveri & Cie., A.-G. It is rated at 40,000 h.p., and has been constructed for the Kommunale Elektrizitätswerk Mark, A.G., in Hagen. The set runs at 1,000 revs. per min., and generates at 10,000 volts, 50 cycles. Including the condensing plant, the weight is 385 tons. The turbine is supplied with superheated steam at 350° C. and 12.5 atmospheres, and has a thermal efficiency of 22 per cent. The consumption is given as 0.612 kg. pounds of coal per kw. hr., with a boiler efficiency of 83 per cent.

**"The Central."**—The July issue of the magazine of the old students of the City and Guilds (Engineering) College opens with an excellent portrait of Dr. W. E. Sumpner, and contains an illustrated article entitled "The Production of an Engineering Newspaper," in which an idea is given of the work involved in preparing and producing ELECTRICAL ENGINEERING. Other articles deal with telegraph experiences in Tibet and tests of Humphrey gas pumps.



## ELECTRIC DRIVE IN A WHOLESALE CHEMISTS' FACTORY

RELATIVE to its size, a wholesale chemists' and druggists' factory calls for a fair amount of electrical power. Cleanliness is naturally of the utmost importance in such work as is here carried on, and this fact, together with the diversified points at which power is required, render an electric drive particularly advantageous. An installation which has been laid down on model lines is found in the factory of

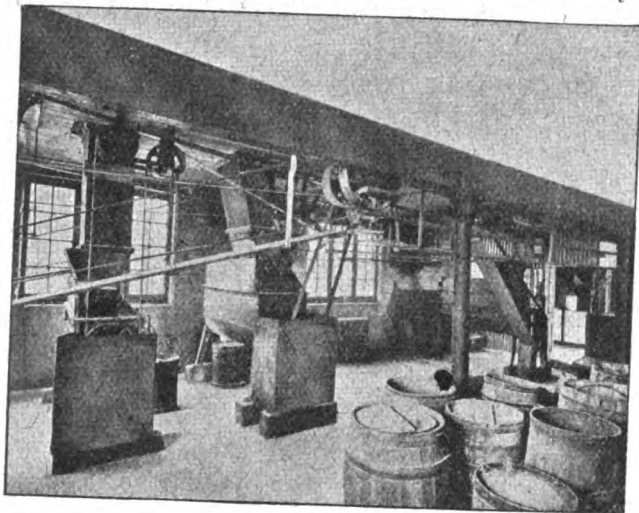


FIG. 1.—ELECTRICALLY-DRIVEN MIXERS AND DISINTEGRATORS.

Messrs. Wilkinson & Simpson, of Newcastle-on-Tyne. In this factory power is used for driving mixing vats employed in the preparation of metal polish and sauces, and for driving bark disintegrators used in the preparation of medicines, for the mixing of health salts, baking powder, and other similar products. In the proximity of the grinders and mixers there is naturally a certain amount of fine dust, though not suffi-

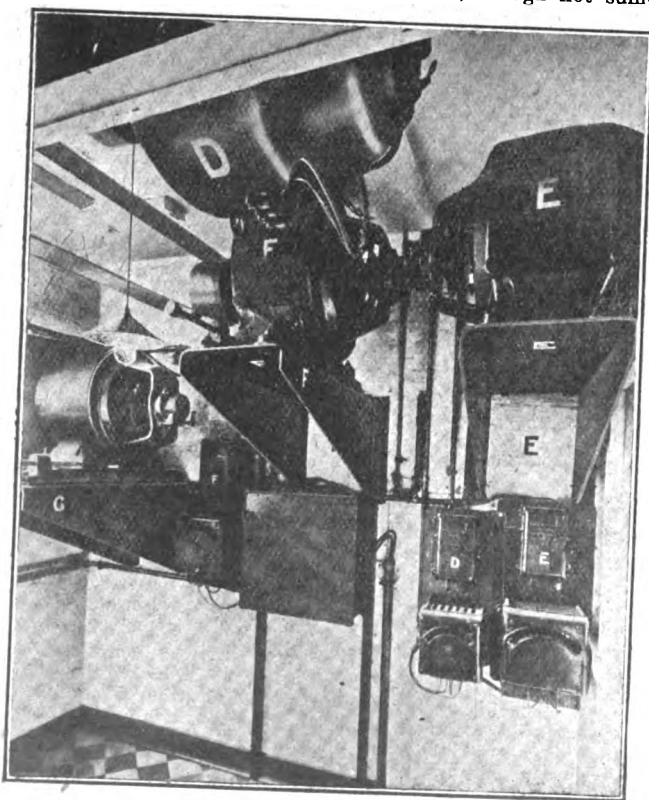


FIG. 2.—INTERIOR OF MOTOR HOUSE.

cient to make it necessary to enclose the motors totally. The "Witton" motors for the most part are enclosed in glass houses, several motors being grouped in one house wherever possible. The motors are fixed sometimes on the ceiling, but more usually on brackets projecting from the wall, and drive through belting. The switchgear is mounted on the wall, and is readily accessible. A view of the drive for mixers

and disintegrators is shown in Fig. 1; the motor house can be seen on the right-hand side with the door open. Its cleanliness and attractive arrangement are well shown in Fig. 2, which is taken looking upward from the door of one of the large motor houses. This motor house contains four motors of 18 h.p., 15 h.p., 7½ h.p., and 6 h.p. respectively. Not all the motors are employed for driving on the floor, from which the view is taken, but operate machinery on the floor above by means of belting. In addition to the purposes previously mentioned, electric drive is also used for the working of hoists and a number of ventilating fans, a considerable number of motors of similar size to those mentioned above being utilised in various parts of the works. The installation throughout reflects considerable credit upon the contractors responsible for its installation—Messrs. T. Toward & Co., Ouseburn, Newcastle-on-Tyne. The motors and switchgear for this factory were constructed by the General Electric Co., Ltd., of Wotton, Birmingham, and 67 Queen Victoria Street, London, E.C.

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

THE South-Western Polytechnic, Manresa Road, Chelsea, will re-open on September 28th, for day classes, and on September 21st for evening classes. The Electrical Engineering courses include practical instruction in the fully-equipped laboratories, and students are prepared for the London B.Sc. degree in Engineering, for the examinations for admission to the various Engineering Societies, and the examinations of the City & Guilds of London Institute. The evening courses include classes in Electrical Wiring, and in this department an advanced course has been arranged for the preparation of candidates for the Final Wiremen's Examination of the City & Guilds of London Institute. Arrangements are made for placing students who have passed satisfactorily through the three years' day course in positions with large engineering firms. The prospectus may be obtained, price 1d., at the Institute, or by post, 4d.

The next session at the Engineering Departments of the University of Leeds will commence on October 5th. Mr. G. D. Aspinall Parr is Head of the Electrical Engineering Department. Full particulars of the courses can be obtained from the Secretary.

Special facilities are given for research work in Electrical Engineering at King's College, London. Among the subjects of special courses of advanced lectures which have been arranged are "The Commercial Aspect of Electrical Engineering" and "Central Station Practice and its Relation to Legislative Enactments." The courses of instruction in Electrical Engineering prepare students for the diploma of King's College and B.Sc. Engineering degree of the University of London. The entrance examination begins on Monday, September 21st, 1914. Full information and syllabus may be obtained from the Secretary or from the Dean of the Faculty of Engineering.

The 125th Award of Prizes at the Crystal Palace School of Practical Engineering takes place to-day, Mr. A. G. Lyster, President of the Institution of Civil Engineers, in the Chair.

**Electric Fire-escapes in Berlin.**—Over half of the Fire Brigade vehicles of Berlin are now power-driven. Of the 74 power-driven vehicles, 48 are electrically propelled, the remaining being petrol vehicles. From the report for the past year, the *Berliner Tageblatt* notes that the electric vehicles have run a total of 62,200 miles or 1,300 miles per vehicle. The cost of upkeep works out very considerably lower than that for horse vehicles. For a complete group of four electric vehicles, the average annual cost, including cost of charging over a period of six years, has been £277 or £69 5s. per vehicle. The annual cost for a horse-driven group of four similar vehicles is £1,095, or £273 15s. per vehicle—that is, sufficient for the upkeep of four electric vehicles. As a result, a saving of over £20,000 has been effected in just over three years in the upkeep of eight groups of each four vehicles. A still greater saving will be effected, as in future all repairs will be carried out in the fire brigade's own workshops. It is also expected that the price for current for charging will be reduced considerably below the present figure of 1.8d. per kw.-hr. At present the batteries are charged every four weeks to preserve the plates against sulphating, but it is hoped that this will be reduced to once every 8 weeks. It will be remembered that some notes on the use of electric vehicles in the London Fire Brigade were given by Lieut. Sladen in the discussion at the Institution of Electrical Engineers in March (*ELECTRICAL ENGINEERING*, March 26th, page 175). The cost of working appears to be lower in Germany than here, but a direct comparison is not possible, as the German costs given above do not apparently include depreciation.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,402.

The writer is interested in the electric driving of reversing rolling mills, and would like to know if the Föttinger hydraulic coupling in conjunction with a high-speed motor has been proposed, and, if so, how do the results compare with a direct-coupled or gear-driven arrangement. How would the coupling behave with such a peaky load as a rolling mill. The writer believes that this patent coupling can act in either direction. If so, a continuously running motor could be used, possibly enabling a Ward Leonard set to be dispensed with. The writer has in mind rolling mills of fairly large size, those in which the continuous rating of the motors is, say, 1,000 h.p. and upwards.—"COUPLING."

(Replies must be received not later than first post, Monday, Aug. 10th.)

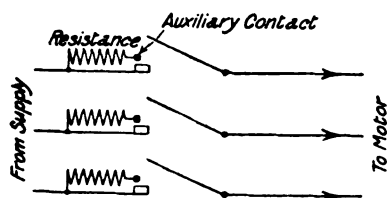
### ANSWER TO No. 1,398.

A three-phase slip-ring motor generator, 400 h.p. 2,200 volts, is loaded about 35 per cent., and is supplied from a distant power station  $2\frac{1}{2}$  miles away, through aluminium lines 37/12 S.W.G. The motor runs satisfactorily until another motor of 300 h.p. is switched in circuit, when a heavy thump is heard shaking the foundation and breaking the bridge connections of rotor winding each time the second motor is switched in; this machine is controlled with reversing switch, and is 500 yds. further away. The thump is not heard in the motor when switching on the motor-generator. The starting current of the motor is about 50 amps. at 2,200 volts.

Can I do anything to prevent this heavy thump?—DEAD EARTH.

An award of 10s. has been made for the following reply from "M."—

"Dead Earth" does not give sufficient information to enable one to say definitely what the cause of the trouble is likely to be, but it appears to be caused by the sudden switching on of the second motor setting up a surge in the circuit. The reason why the same thing does not occur when the motor generator is started up after the 300 h.p. machine may be due to the fact that the conditions of the circuit, as regards capacity and inductance, are different, and it is only under certain con-



ditions that a severe surge is likely to be produced. The way to overcome this trouble is to bring the current up more gradually by switching on through a resistance, in much the same way as in a D.C. motor; it is, however, usually sufficient to provide only one step. This may be done by providing the control switch with a set of auxiliary contacts, and connecting

the resistance between the main and the auxiliary contacts in such a way that in the act of closing the switch the resistance is first put in circuit and then short-circuited. A suitable resistance in this case would have a value of about 25 ohms (twenty-five), and should be rated to carry about 30 amps. for one second. The resistance may be of carbon powder in earthenware troughs, such as is supplied by the Morgan Crucible Co., or may be of high resistance carbon rod such as is used for lightning arresters, or it may be a metallic resistance wound non-inductively. The diagram shows how the resistances should be arranged in each phase.

### ANSWERS TO No. 1,400.

In connection with aluminium electrolytic lightning arresters, what is the electrolyte (giving a critical A.C. voltage of about 300) that is generally used? Is it true that only one wave of the alternating current produces the insulating film by converting the aluminium in hydroxide, while the opposite wave has no effect? Also, is it necessary to form the film or even part of it before assembling the aluminium trays?—"ARRESTER."

A first award of 10s. has been made to "A. G. T. C." for the following reply:—

The exact composition of the electrolyte used in lightning arresters of the electrolytic type is usually regarded as something of a trade secret by the manufacturers. The properties of an electrolytic lightning arrester are due to the characteristic of a film of aluminium hydroxide formed on a plate of aluminium by electrolytic methods. The plates are usually sent out by the manufacturers with the films already formed, but as a precaution against damage in transit, the operation is performed again after erection. This is done by connecting a 250-volt A.C. circuit between every two plates successively, sufficient lamps being in circuit to limit the current to about 2 amps. If the films are in order, the lamps will burn dimly, but if not, the lamps will be bright, gradually becoming dim as the films form. Both waves of the A.C. current are effective, one half on one plate and one half on the other. If D.C. current is used, it should be reversed for each cell. The film slowly dissolves in the electrolyte, so that the forming operation should be carried out if the arrester is out of service for some time. In practice it is usual to bridge the horn-gaps in series with the arrester once a day.

The second award (5s.) is made to "A. L.," whose reply is given in slightly abridged form below:—

The composition of the electrolyte is not, as a rule, stated by the makers. The aluminium cones as received from the manufacturer have the film of aluminium hydrate partially formed, so must be very carefully handled, by the rim only, when assembling in stacks. After filling the cones with electrolyte, the cells should be tested by putting about 300 volts A.C. across each in succession. Connect a resistance in series sufficient to limit the current flow to about 2 amperes with cell shorted out, so as to limit the current flow if the film of hydroxide is not fully formed. It is convenient to put lamps in series as a resistance, then they burn brightly with unformed cells, but as the film thickens up they glow dimly. The latter indication will be given at once if the film is fully formed, or if the cell is empty of electrolyte, which can readily be noted. If only a D.C. source of supply is available at the time of "forming," it must be applied first in one direction, then in the reverse polarity, as both A.C. waves have a "forming" effect, and it is necessary, therefore, to "form" on both sides of the aluminium cones. "Forming" of the film before placing the arrester on the line is necessary to limit the charging current required, which would otherwise be excessive and liable to set up dangerous surging. After filling up the arrester cones, they should be put in service as soon as possible, because the electrolyte has a solvent action on the film when standing idle.

[The actual composition of the electrolyte in the lightning arrester is, as our correspondents say, not made public by the makers. A patent for a lightning arrester of this type (No. 6,872/09) was allowed to lapse this month, as announced in our Patent Record on July 16th, and this gave the following recipe: Six parts of boric acid are added to one part of tartaric acid and the mixture neutralised by adding sufficient ammonium hydrate. Ten per cent. of glycerine is now added and the resulting acidity of the solution is again neutralised by the addition of more ammonium hydrate. As the patent has been allowed to lapse, this is probably not the exact electrolyte now employed.—ED. E.E..]

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published July 23rd, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

14,892/13. **Vacuum Tubes.** B.T.-H. Co. (*G.E. Co., U.S.A.*). The remarkable feature of these tubes is that instead of their action depending upon the ionisation of the gas contained in the tubes, every effort is made to exclude all trace of gas from the interior, and the current is carried from the cathode to the anode by electrons emitted from the heated cathode. The latter consists of a flat spiral of tungsten wire which may be conveniently heated from an independent source of current. By adjusting this current, the "hardness" of the "X" rays emitted from the tube can be regulated at will. The anode, which also serves as a target for the electrons, consists of a flat disc held on a stem and sealed into one end of the bulb. Both stem and disc should be preferably of wrought tungsten. A focusing device for ensuring stability of the focal point is also included. It consists of a hollow cylinder of suitable conducting material located inside the tube, round the cathode and electrically connected to the latter. Eight figures. (See also ELECTRICAL ENGINEERING, June 25th, p. 369.)

15,673/13. **Wireless Telegraph Transmitter.** J. G. BALSILLIE. The radiator circuit is electrostatically coupled, i.e., through condensers, to the charging circuit, and is energised by unidirectional excitation. The charging circuit, comprising capacity and inductance, is synchronised with a primary circuit, including an A.C. generator. A portion of the charging circuit is bridged by a rectifying discharge gap, adjusted so that no high-frequency oscillations can occur in the exciting circuit, so formed. One of the electrodes of the gap has a central hole through which air is forced, at a pressure of about 100 lb. per sq. in. The radiating circuit, which may or may not be provided with tuning inductance, has considerable capacity, so that it is itself capable of oscillating. The advantages claimed are that the aerial radiates its own pure wave, and that the radiating power is very high. Thus with a primary energy of 3 kw. it has been found possible to radiate 1½ kw. Four figures.

18,355/13. **Arc Lamp Electrodes.** B.T.-H. Co. (*G.E. Co., U.S.A.*). This invention consists in employing a lithium compound such as borate, fluoride, or oxide as a steadying material in white arc light electrodes. In the case of titaniferous electrodes it is found that the addition of the lithium compound increases the intensity of the light produced, so that the invention also includes the addition of a lithium salt to such electrodes as an intensifying agent even if other steadying materials are also present. A satisfactory electrode has been made by mixing 96 per cent. of finely powdered titanium carbide with 3 per cent. of black copper oxide and 1 per cent. of lithium fluoride in a thin iron tube.

## Specifications Published To-Day

The following Patent Specifications will be published to day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** BARKER (Thompson Electric Co.) [Hanger for h.t. lamps] 16,791/13; KORN [Operation of intense current arcs] 4,230/14; AYRTON [Carbons] 6,104/14; KORTING & MATHIESEN AKT.-GES. [Vapour lamps] 11,644/14.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** PETERSEN and KEMP & LAURITZEN [Distant control] 16,152/13; WATKINS [H.T. insulators] 3,150/14; DESPESAILLES [Lighting installations] 7,938/14.

**Dynamos, Motors, and Transformers:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Motors for ships] 15,199/13; BOERRIES [Motor supports] 15,554/13; LUCAS and MOORE [Dynamo-electric machines] 16,015/13; GARDE & KOEFOED, HAUBERG MARSTRAND & HELWEG AKTIE-ELSKABET TITAN [Winch motor] 20,135/13; SIEMENS SCHUCKERTWERKE GES. [Commutator A.C. machines] 2,409/14.

**Electrometallurgy and Electrochemistry:** GOLDSCHMIDT AKT.-GES. [Rail welding] 25,179/13; FRIED KRUPP AKT.-GES. [Cooling of furnace electrodes] 6,731/14.

**Heating and Cooking:** PERRY [Heating apparatus] 11,937/14. **Ignition, &c.:** FORD [Magneto] 15,656/13; HARTFORD [Engine starter] 19,524/13; KETTERING and CHRYST [Ignition systems] 6,072/14.

**Incandescent Lamps:** SIMPSON [Manufacture of tungsten] 15,297/13; SWINBURNE [Vehicle lamps] 19,985/13.

**Instruments and Meters:** CHURCHWARD [Pyrometers] 15,922/13. **Batteries, &c.:** ACHENBACH [Galvanic cells] 10,616/14.

**Switchgear, Fuses and Fittings:** KETTERING and CHRYST [Switches] 7,545/13; SIEMENS BROS. DYN. WKS., LTD., and BOLTON [Blow-outs] 17,712/13; GEIPEL and MARGERISON [Resist-

ances] 1,248/14; TORCHIO and WOODROW [Circuit-breakers] 10,004/14.

**Telephony and Telegraphy:** LOPEZ and CREED, BILLE & Co. [Telegraphy] 15,561/13; PINTER [Telephone call meter] 15,675/13; BROWN [Telephony] 15,828/13; ORLING and ORLINGS TELEGRAPH INSTRUMENT SYNDICATE, LTD. [Duplex telegraphy] 16,268/13; BARWELL and EASTERN TELEGRAPH Co. [Duplex telegraphy] 16,435/13; RAYMOND-BARKER [Telegraphs] 27,225/13; NIGRON [Printing receivers] 1,548/14; WESTERN ELECT. Co. (*Woodward*) [Telephone receivers] 1,968/14; GRAHAM and RICKETS [Telephone systems] 6,097/14.

**Traction:** JOHNSON and THORROWGOOD [Railway signalling] 13,064/13; A.E.G. [Current collectors] 5,594/14; SOC. ANON. DES AUTOMOBILES ET CYCLES PEUGEOT [Lighting system] 9,175/14; CARDWELL [Signalling systems] 11,516/14.

**Miscellaneous:** JOYCE & SPAGNOLETTI, LTD. [Safety-lamp igniter] 17,529/13; ALLISON [Illuminated fountains] 22,765/13; MASCHIN-ENFABRIK OERLIKON [Electro-hydraulic presses] 26,340/13; A.E.G. [Ticket printing machine] 6,332/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Arc Lamps:** LEWIS [Carbons] 22,222/13; CONRADTY [Carbons] 22,223/13.

**Dynamos, Motors and Transformers:** AKT.-GES. BROWN, BOVERI ET CIE [Rotary converter] 24,305/13.

**Electrometallurgy and Electrochemistry:** CASELLA [Manufacture of electrodes] 14,582/14.

**Incandescent Lamps:** RENAULT [Headlights] 15,052/14.

**Telephony and Telegraphy:** GILES [Condensers] 10,868/14, 11,404/14; A.E.G. [Condenser connections] 15,580/14.

**Miscellaneous:** MEYER [Vacuum-tube apparatus] 15,399/14.

The following Amended Specification may now be obtained:—

**Traction:** S. L. PRICE [Dynamos for vehicle lighting] 19,345/12.

## Opposition to Grant of Patents

6,806/13. **Regenerative Motor Control.** CROMPTON & Co., LTD., and H. BURGE.

19,857/13. **Anti-Vibration Lampholder.** F. H. REEVES. The Comptroller has decided to allow the grant of these two patents.

## Expiring and Expired Patents

The following Patents expire during the current week, after the life of fourteen years:—

13,721/00. **Motor Control System.** B.T.-H. Co. (*C. L. Perry*). This system is particularly applicable to electric trains, where two or more motors are to be operated by series-parallel controllers having a number of separately actuated contacts. The coils for actuating these contacts are connected to the master controller so that they may be connected in series and operated from the line potential. When only a few coils are in operation an additional resistance is introduced into the circuit to prevent an excessive current. The advantage of this arrangement is that whilst only a small current is drawn from the line for energising the coils, the latter need not have so high a resistance as would be necessary if they were operated in parallel across the line. This enables considerable economies of space and material to be effected. Eight figures.

13,975/00. **Motor Control System.** B.T.-H. Co. (*C. L. Perry*). This invention applies to the same class of work as the preceding one, and has for its object the reduction of the number of conductors between the master controller and the other controllers. The actuating coils for the contact devices are connected across every pair of conductors, thus enabling as many contact devices to be actuated from a given number of conductors as there are combinations of such conductors taken two at a time, i.e., with  $n$  conductors  $n(n-1)/2$  contacts could be actuated. Three figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** A. H. ARMSTRONG [Motor control system applicable to induction motors working in tandem] 22,279/01; F. BASENAU [Insulating compound] 8,071/02.

**Dynamos, Motors and Transformers:** M. PFATISCHER [Motor control by use of interpoles] 7,286/05, 7,286A/05.

**Ignition:** H. L. MAILLARD [Magneto] 2,694/05; CHAMBERS MOTORS, LTD., and A. M. PATTON [Magneto] 7,747/08.

**Incandescent Lamps:** P. M. JUSTICE (*Deutsche Gasglühlicht Akt.-Ges.*) [Filament supports] 8,499/06.

**Switchgear, Fuses and Fittings:** J. WILSON [Automatic cut-out] 25,224/09.

**Telephony and Telegraphy:** W. P. THOMPSON (*Ges. für Drahtlose Telegraphie*) [Wireless detector] 8,659/06; R. K. GRAY [Method of loading cables] 8,419/09.

**Miscellaneous:** H. A. CAMPICHE [Clocks] 7,211/05.

## ELECTRIC TRACTION NOTES

The Hastings & District Electric Tramways Co. has been fined £5 for continuing to use the Dolter surface-contact system along the sea front for three months beyond the time-limit allowed by the Board of Trade. The police took action against the Company on account of the reports that pedestrians had received shocks, and that three horses had been killed. The Dolter cars have now been replaced by cars driven on the Tilling-Stevens petrol-electric system.

There has been considerable feeling on the part of drivers in the employ of the L. & S.W. Ry. Co. at the possibility of their positions being jeopardised by the introduction of electric traction. After much discussion the Railway Co. has agreed that the whole of the engine-drivers and firemen at present employed on steam trains shall be engaged on electric trains at their present rates of pay, and that they will be offered positions in order of seniority, subject to them being qualified. The cause of the trouble was that the Company had appointed men of other grades than locomotive engineers and firemen as motormen on the electric trains.

The Post Office tube railway was referred to in the House of Lords on Thursday, when Lord Newton asked if tenders had been invited for the supply of electric power. Under the Act dealing with the railway, the Post Office is prohibited from supplying itself with power for this railway, if it can obtain it cheaper elsewhere, and Lord Strachie, on behalf of the Government, said that there was no intention of neglecting the obligations imposed by the Act. Lord Sydenham expressed the opinion that it would be unwise, in view of the unsettled state of electric supply generally in London, to embark on a new installation for the purposes of the railway.

The Highways Committee of the L.C.C. recommends application being made to Parliament next session for authority to enable the Council to run trailer and coupled cars on the tramways north of the River Thames. Under the Council's Act of 1912, the use of trailer cars on the south of the river was restricted to certain routes, but the Board of Trade has since sanctioned their use on almost the whole of the southern system.

Interim dividends are declared by a number of London electric railway companies. The Metropolitan District Railway Co. recommends the full dividends on the 4 per cent. guaranteed stock and the  $4\frac{1}{2}$  per cent. and 3 per cent. preference stocks; 4 per cent. is recommended on the preferred ordinary stock of the Central London Railway Co., and 1 per cent. on the ordinary shares of the London Electric Railway Co. No dividend is recommended on the ordinary shares of the City & South London Railway Co., but the full preference dividend will be paid.

An issue of 70,000 six per cent. £1 preference shares has been made by the Northern General Transport Co., which was recently formed, and has now a controlling interest in the Gateshead & District Tramways Co., the Tynemouth & District Electric Traction Co., and the Jarrow & District Electric Traction Co.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

On Friday, July 25th, Mr. Justice Eve delivered judgment on the Marconi v. Helsby Wireless Patent case. It will be remembered that the plaintiffs, Marconi and Marconi's Wireless Telegraph Co., claimed damages from the Helsby Wireless Telegraph Co. in respect of four wireless installations on ships belonging to the L. & N.W. Ry. The difference between the defendants' apparatus and that described in Marconi's Patent No. 7,777/00 was the inclusion of two extra spark gaps and a through charging coil (see diagrams in ELECTRICAL ENGINEERING, July 2nd, p. 381). His Lordship held that whilst these two gaps did shorten the main spark, yet this did not make the action of the apparatus fundamentally different from that of Marconi's apparatus. The real question was: "Is it an essential feature of Marconi's invention that the primary should continuously feed the secondary during the whole period of radiation?" This he found not to be the case. In the defendants' apparatus the primary built, and for a time

maintained, the oscillations of the aerial circuit. It was therefore substantially the same as was covered by the claims of Specification No. 7,777/00, and was an infringement. Regarding the plea of invalidity which was put forward by the defendants, the Judge found that neither the writings of Tesla or M. Ducretet taught the world the substance of Marconi's invention. The Patent was therefore valid. Judgment was accordingly entered in favour of the plaintiffs, who are entitled to an inquiry into the amount of damages due in respect of the infringements. Defendants are to pay costs of the action.

Arrangements are now well advanced for the observations for investigation of the effect of the total solar eclipse on August 21st on wireless telegraph transmission, when five high power stations at St. Petersburg, Bobrouisk, Norddeich, Paris, and Nauen, all using different frequencies, will send out special signals during the eclipse. That at Bobrouisk will be situated within, St. Petersburg to the east, and the others to the west of the path of the umbra. A full programme has been issued, and forms to be filled up by observers have been prepared. It is desired in particular to investigate the influence on the strength of the signals crossing the shadow, of the re-combination of the ions due to the withdrawal of the ionising sunlight, and to determine how quickly these actions take place. Experimenters in wireless telegraphy possessing such apparatus of precision as will enable them to make accurate measurements are invited to communicate with Mr. W. Duddell, F.R.S., 56 Victoria Street, S.W. Prospective observers willing to make aural estimates of signal strength, or to make observations on strays (either by the Graphic Record method, or by the method of registering the number heard during every thirty seconds) should send an intimation to that effect, with a notification of which portion of the observations they could undertake, to the Hon. Sec., B. A. Radiotelegraphic Committee, 88 Gower Street, W.C. They should also state the number and the names of those of the five sending stations with which it would be most convenient for them to work.

According to *The Times* Shanghai correspondent, the new wireless station on the Telefunken system at Woosung is complete. This station is one of six provided for in an agreement last year. Three others have also been completed, and those at Swatow and Hankow remain to be erected. In this connection it is of some interest to remember that an agreement is in contemplation between the Marconi Co. and the Chinese Government for the erection of wireless telegraph stations.

During the consideration of the Merchant Shipping (Convention) Bill by the Standing Committee of the House of Commons last week, some discussion took place with regard to Clause 17, which deals with the provision of wireless apparatus on ships in relation to a proposed agreement between the Board of Trade and the Marconi Co. for the supply of wireless telegraph apparatus and operators to mercantile shipping. The shipping industry was strongly averse from this agreement on the ground that they might have to pay monopoly prices for the apparatus, and this objection was expressed before the Committee very emphatically by Sir Henry Norman, Sir Croydon Marks, and others. The President of the Board of Trade said that the negotiations had been entered with the Marconi Co. with a view to arriving at some reasonable working agreement which would protect shipowners against unfair or arbitrary prices for the supply of apparatus. Eventually, however, the amendment to Clause 17, embodying the proposed agreement, was withdrawn.

Owing to the political disturbance on the Continent, telegraphic conditions have been unsettled. Already on Monday private telegrams for Austria and Hungary had to be written in plain language, viz., German, French, English, or Italian, and Hungarian was also authorised for messages to Hungary. Neither trade marks nor commercial terms were, however, admitted. Telegrams without text or containing military intelligence were prohibited. Later telegrams to Germany, Austria, Hungary, Bosnia-Herzegovina, Roumania, and Bulgaria were subject to delay owing to failure of lines and pressure of business. The Hungarian administration, on the strength of Article 7 of the St. Petersburg Convention, advised that partial restrictions were established on telegrams, i.e., until further notice private telegrams in code and cipher, containing exchange prices in figures, commercial marks, and those without text were prohibited. Any telegrams had to be written in Hungarian, Croatian, German, French, English, or Italian. Censorship was established generally and telegraphic communication between Hungary and Serbia was suspended. On Tuesday, however, telegrams for Serbia could be sent *via* Great Northern Company *via* Russia and Roumania at 5d. per word, and *via* Russia and Bulgaria at 6d. per word, and another route *via* Eastern and Salonica was also available at 6d. per word. Up to yesterday afternoon these routes were still open. Notice of delay to Germany has been cancelled.



## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 437. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**"FREEZOR" FANS.**—For the use of electrical contractors who are keeping abreast of the times by making a speciality of "Freezers" during the hot weather, a neat folder has been designed by the General Electric Company, Ltd. In it are given several cogent reasons for adopting these fans in offices, shops, restaurants, and the home. The fact that the fans are entirely British made is a point that will probably appeal to a large number of prospective purchasers. The company will be pleased to send a supply of the folders to any contractors on application.

**HEATING AND COOKING.**—The Edison and Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), has just issued a catalogue dealing with the well-known "Ediswan" heating and cooking specialities. Practically all the usual types of apparatus, such as kettles, grills, ovens, and hot plates for cooking, and irons, domestic and industrial, are included. An ingenious combined lamp carrier and adapter, which is particularly suited for use with irons, is also described.

**TELEPHONE APPARATUS.**—A useful catalogue has been issued by Siemens Bros. & Co., Ltd. (Woolwich, S.E.). It covers a wide range from inexpensive house telephones to C.B. and automatic exchange switchboards. Among the novelties, we notice a new type of vacuum lightning arrester arranged inside an ebonite insulator for fastening on the overhead line at the point of junction with the underground cable. The "hand-com." instruments for house telephones have all terminals inside so that the necessity of threading the cord through the stem is obviated, and a detail of interest in the exchange boards is that the cords are fitted with a patent spiral steel protector, which, it is said, increases their life fourfold.

**ELECTRIC SIGNS.**—A most artistically produced booklet gives some very suitable advice to contractors and others on electric signs, and illustrates some very attractive patterns supplied by Simplex Conduits, Ltd. (Garrison Lane, Birmingham).

**TELEPHONES.**—A comprehensive list of telephones and accessories is to hand from the Edison & Swan United Electric Light Co., Ltd. (Ponder's End, Middlesex). An extensive range of domestic and inter-communication sets are included,

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

as well as battery and magneto instruments for public and private lines or for longer distances. Other specialities are mining telephones and special metal-cased instruments for hospitals and other large institutions. Electric mine exploders are dealt with in the same catalogue.

**FANS.**—A very tastefully executed brochure from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), contains an illustrated description of the company's large electric fan works at Witton, Birmingham, where the popular and excellent "Freezor" fans are manufactured in very large quantities. Some descriptive notes on this works were given in *ELECTRICAL ENGINEERING*, June 11th, page 323.

**METERS AND CONTROL GEAR.**—A leaflet from the Electrical Apparatus Co., Ltd. (Vauxhall Works, South Lambeth Road, S.W.) calls attention to some of the company's latest designs of E.A.C. high-torque house service meters, motor-starters, and control gear.

**MOTOR-STARTERS.**—A number of patterns of autotransformer starting panels for squirrel-cage induction motors are dealt with in a new collection of price sheets from George Ellison (Victoria Works, Warstone Lane, Birmingham).

**USES FOR ALUMINIUM.**—This forms the subject of a neat little booklet issued by the British Aluminium Company, Ltd. (109 Queen Victoria Street, London, E.C.), showing the advantages of employing aluminium for a great variety of purposes, ranging from the manufacture of aeroplane propellers to that of candlesticks. Amongst the electrical applications may be mentioned underground and overhead power transmission, switchboard and battery connections, and magnet windings for electrical machinery. It is interesting to note in regard to this that the weight of an aluminium conductor is only half that of a copper conductor with the same current-carrying capacity.

**FLAME ARC LAMPS.**—A booklet issued by Crompton & Co., Ltd. (Chelmsford, Essex), describes their open-type Crompton-

Blondel flame arc lamps. Particulars of the burning conditions for various sizes of lamps are given, and we note that these have been revised in accordance with the latest investigations. The number of burning hours obtainable per trim has been increased in many cases. Particulars are also given of the raising and lowering gear, choking coils, auto-transformers, and other accessories.—Another leaflet from the same company relates to their enclosed arc lamps, which can be supplied to burn in parallel, in series, or in series parallel on A.C. or D.C. circuits. Two types are manufactured, viz., "Single Carbon" and "Twin Carbon." The former are designed to burn singly or in series, allowing 100 volts per lamp, whilst the latter burn singly on 200/250 volts.

**INTERLOCKED SWITCH AND PLUG.**—A leaflet from the Adnil Electric Co., Ltd. (Artillery Lane, E.C.), describes a continuous switch fuse and earthing plug in dust-proof cast-iron case, arranged so that the plug cannot be withdrawn unless the switch is off, nor can the switch be put on unless the plug is in.

### THE "SMIT" TRANSFORMER

SOME very good results have been obtained from the "Smit" three-phase oil-cooled transformers which are being introduced into this country by Mr. E. E. St. John (Queen Anne's Chambers, Westminster, S.W.). The drawing below shows the internal construction of the 1,250 k.v.a. size, several of which, we understand are in satisfactory operation on the Continent. The cores and yoke

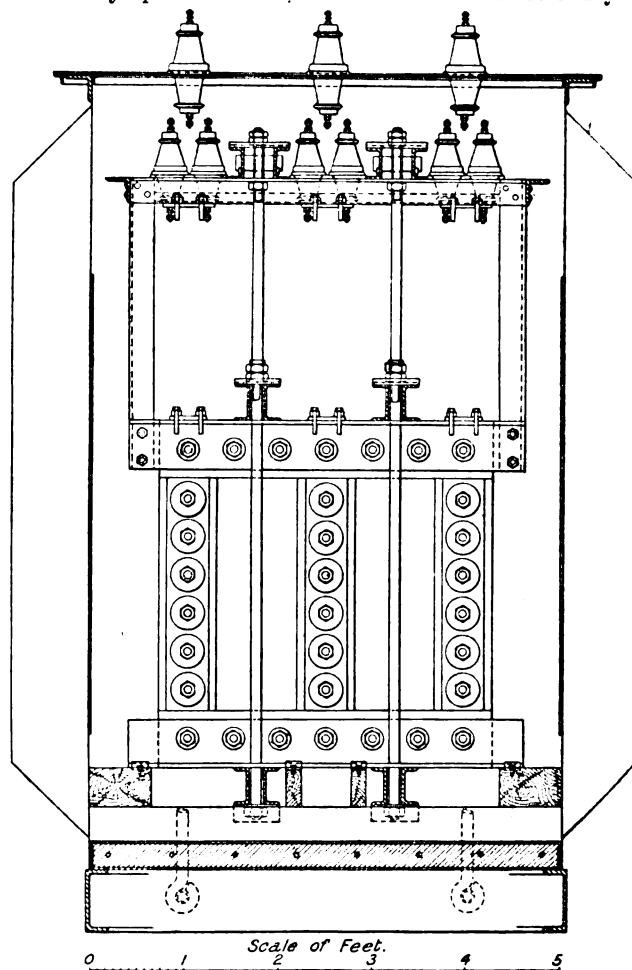


FIG. 1.

are built up of paper-insulated, silicon steel stampings with exceptionally low hysteresis factor. A section of one of the cores can be seen in Fig. 2. It will be noticed that the corners are stepped back, so that in winding the coils, sharp corners are avoided. Stout angle irons and insulated bolts are used

## "Prana" Die Castings



will **lighten your costs** very considerably.

They leave the dies in a **finished, ready-**

**for-use state, accurate** to a degree only obtainable (by other methods) by long and costly "micro-machining." In addition to this **each one is an exact duplicate of all the others**—and so all die cast parts are **automatically interchangeable**, but they must be "**Prana.**"

**AERATORS Ltd., UPPER EDMONTON, N.**



**Ladders, Steps, Trestles, Scaffolds, &c.**

Sale or Hire.

**HEATHMAN & CO.**

10, Parson's Green, London, S.W.



**MARRYAT & CO.**

**DYNAMO & MOTOR HOSPITAL,**

28, MATTON GY LONDON, E.C.

**PHENIX**  
**ASSURANCE COMPANY, LIMITED.**  
 ESTABLISHED 1782.

Head Offices: 19 & 70, LOMBARD STREET, LONDON, E.C.

TOTAL FUNDS EXCEED	CLAIMS PAID EXCEED
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**FIRE - LIFE - ACCIDENT - MARINE**

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**ELECTRIC LIGHTING.**

The Company has always encouraged the development of Electricity, and the well-known "Phoenix Fire Office" Rules for Electrical Installations are in use throughout the world. Copies will be supplied free on application to Head Offices.

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**SHEETS, RODS, TUBES, ACCUMULATOR BOXES, &c.**

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VULCANITE WORKS:  
**Dr. HEINR. TRAUN & SONS,**

(Formerly HARBURG INDIA-RUBBER CO.)

London Warehouse  
**F. WINTER, 25 Goswell Road, E.C.**

Vulcanite.

for pressing the yokes together, and as can be seen in the drawing, this ensures great strength combined with simplicity. The case is of welded sheet-iron with a comparatively light cover which can be removed for inspection or to enable the inter-connections of the windings to be altered if required.

The windings, which are not shown in the drawing, are of

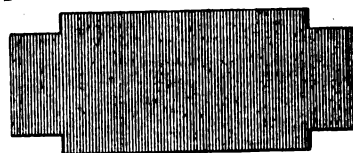


FIG. 2.—1/10 Size.

the cylinder type, the high-tension windings being situated directly outside the low-tension windings and separated from them by insulating material. A test on the above transformer gave the following results:—

Primary voltage	...	10,740
Secondary voltage	...	2,000
Frequency	...	50 cycles per sec.
Full-load iron loss	...	5,250 watts
copper loss	...	11,200 watts
efficiency	...	98.7 per cent.

The insulation test was 22,000 volts, alternating, applied between high and low tension windings and between high-tension windings and core, and 5,000 volts between low-tension windings and core for one minute.

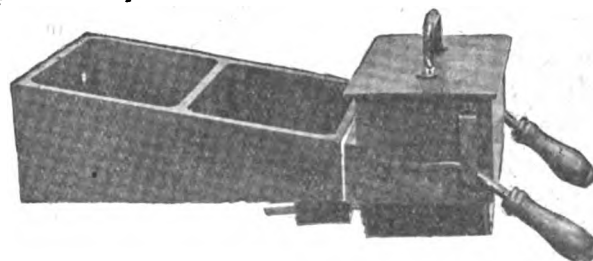
The chief point of interest in these figures is the low iron loss, and in consequence the high efficiency at light loads.

## AMPERE HOUR METERS AND CIRCUIT BREAKERS FOR AUTOMOBILES

A FORM of ampere-hour meter which can be used on electric cars to indicate the amount of charge remaining in the battery at any moment, and can be interlocked with a circuit to prevent overcharge, is described in a booklet from Edison Accumulators, Ltd. The Sangamo ampere-hour meter, for which the Company are sole British agents, is in almost universal use in America, and is of very great utility to the driver. In its usual form a pointer moving forward for discharge and backward for charge over a circuit scale reads direct in ampere-hours, and an integrating mechanism can be provided to record the total amount of charge, a very useful addition from the cost-keeping point of view. Special relay contacts control the circuit-breaker, which is tripped when a full charge has been received, and in one form of the instrument the dials can be placed at a different part of the car from the actuating mechanism. The meter itself consists essentially of a small electric motor with its moving system completely immersed in mercury in a non-spilling chamber. The construction is substantial, and the apparatus is in every way fit to stand the shocks of roadwork. The circuit-breaker has a simple electro-magnetic trip, and is provided with auxiliary contacts which break the tripping circuit. The apparatus is largely used in America for train-lighting batteries, as well as for automobile work.

## A SEALING-WAX HEATER

WE illustrate here a new pattern of electrical sealing-wax heater which has been introduced by Simplex Conduits, Ltd. (Garrison Lane, Birmingham), and is finding extensive application in post offices, banks, &c. The wax container is

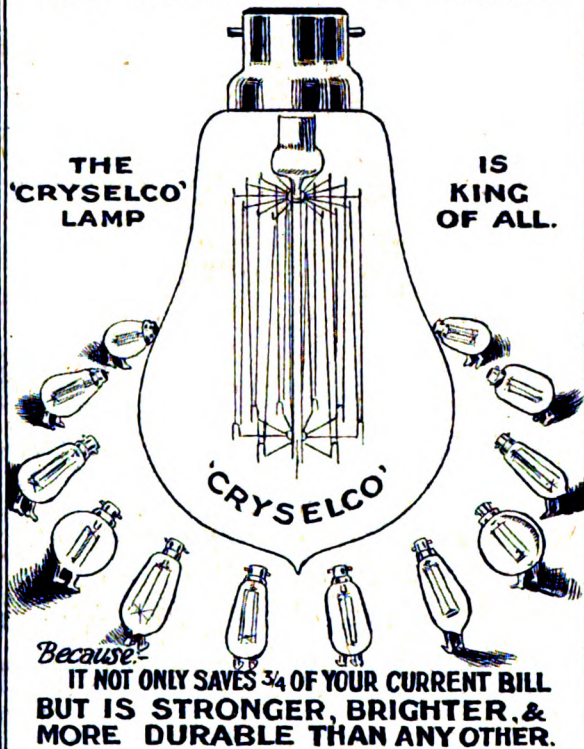


SEALING WAX HEATERS.

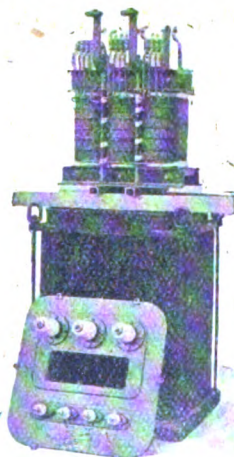
of cast-iron, and this is supported from the wall by means of a rigid bracket arranged so that the container comes well over the table. There are two outlets for the wax, each operated independently by lever handles. There is a heat insulating pad interposed between the container and the bracket. Two sizes are made, for 250 and 400 watts respectively.



ALL OTHERS BOW BEFORE  
*The*  
**'CRYSELCO'**  
METAL FILAMENT LAMP.



## SMIT TRANSFORMERS



**RELIABILITY. LOW IRON LOSS.  
CLOSE REGULATION.  
GOOD OVERALL EFFICIENCY.  
COMPETITIVE PRICES.**

Sole Agent for the British Empire:—

**EDWARD C. ST. JOHN, M.I.E.E.**  
Queen Anne's Chambers, Westminster, LONDON, S.W.  
Telephone: Victoria 6196. Telegrams: "Switchonia, London."  
CODE—A.B.C., 5th Edition.

### A HUGE CONSIGNMENT

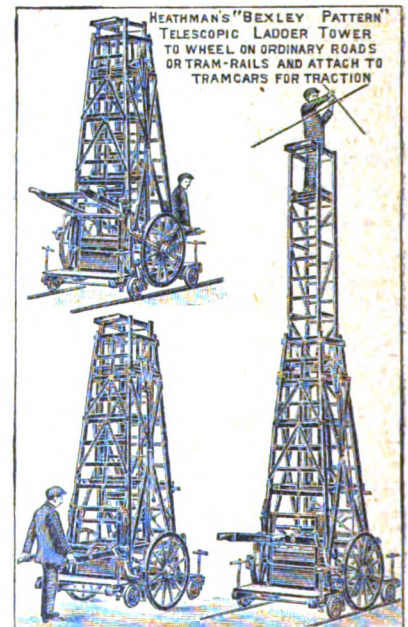
THE notice on the side of the motor waggon illustrated here is self-explanatory. This consignment left the British Thomson-Houston Co.'s stores at Mazda House, Upper



Thames Street, at 6 p.m., on Thursday, July 9th. Nothing that could be said here would add to the impressiveness of the inscription on the lorry.

### A NEW TOWER LADDER

THE illustrations herewith show a new telescopic ladder tower designed by Mr. Heathman, the experienced maker of Parsons Green, London, for use at Bexley Heath. It is fitted with tall wheels to travel upon ordinary roads, and also flanged wheels for tram rails, with brakes to operate upon both sets of wheels. The extension section adjusts at intermediate heights, and is surmounted with a guard-rail and tool table, while plumbing jacks are provided to set the tower vertical for use upon a hill. The construction is well braced to secure durable rigidity, and a coupling bar is fitted to attach behind a tramway car.



**Sizes of Half-Watt Lamps.**—By a printer's error, the sixth line in the voltage column in the table of sizes and prices of half-watt lamps on page 422 of our last issue was set at 200 to 255, instead of 100 to 130. The standard sizes of half-watt lamps for 100 to 130 volts are 200, 300, 500, 1,000, and 1,500 watts.

**G.E.C. Sports.**—On Saturday, July 18th, the Witton Athletic Club held their annual sports at Witton. These are open to the whole of the G.E.C. organisation, and large contingents of competitors came from the branches and works in all parts of the country. Over 50 came from Cardiff, and Osram Lamp Works contributed a strong team. Amongst the valuable prizes were the Hallgarth Cup for the 100 yards race, the Byng Cup for the best relay team, the Directors' Cup for the department showing the best athletic prowess, and a magnificent trophy, the Hirst Cup, for the finest G.E.C. athlete. The Directors' Cup was won by Section 5 of Witton Works (Switchgear Department, Arc Lamp Department, Export Department, and Publication Department), and one of their number carried off the Hirst Cup. The Byng Cup was gained by Osram Lamp Works, and the tug-of-war by the Witton Engineering Department. At the conclusion of the sports Mrs. Railing presented the prizes.



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Belfast.**—Electric motor tower waggon. City Electrical Engineer. August 24th. (See advertisement on another page.)

**Birkenhead.**—An open-type water-cooling tower with 100,000 gallons per hour capacity is required. August 10th.

**Bristol.**—A loan of £42,000 is recommended for requirements in connection with mains, sub-stations, and services during the next three years.

**Bury.**—Sanction has been received to a loan of £40,720 for extensions at the electricity works.

**Eastbourne.**—Additions to switchboard. Borough Electrical Engineer. August 18th.

**Farnworth.**—A Local Government Board inquiry has been held concerning a loan of £1,900 for plant and £1,500 for prospective expenditure on mains.

**Ilkley.**—The Local Government Board has sanctioned a loan of £18,000 for electrical extensions.

**London: Battersea.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £3,275 for electrical extensions.

**St. Pancras.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £22,530 for a 5,000-kw. turbo-alternator, &c.

**Stepney.**—The Finance Committee of the L.C.C. recommends sanction to loans of £35,000 and £3,000 for electrical extensions.

**L.C.C.**—Following the substitution of turbines for a number of the reciprocating engines at the Greenwich power-station, the Highways Committee has now recommended a similar substitution of turbines for the two remaining reciprocating engines. The estimated cost of two 8,000-kw. steam turbo-generators, additional condenser water piping, &c., is put at £88,000. In making this recommendation, the Highways Committee points to the increase in load on the power-station which will follow the additional trailer cars now being put into operation, and when additional through-running arrangements are completed. The installation will include four induced-draught fans for the B. & W. boilers, which are strongly recommended by Messrs. Kennedy & Donkin, the Council's Consulting Engineers. The recommendation was passed at Tuesday's meeting.—There is also to be an expenditure of £18,500 for cables.

**Newport (Mon.).**—Converting plant. Borough Electrical Engineer. August 17th. (See advertisement on another page.)

**Oldham.**—A D.C. motor-generator is required; extensions are to be carried out to the H.T. switchboard. Town Clerk. August 16th.

**Stalybridge.**—The Joint Tramways and Electricity Board requires a supply of E.H.T. three-core, lead-covered insulated cable. Engineer-in-Chief.

**Wallasey.**—The Local Government Board has sanctioned the borrowing of £64,500 for the new power station.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bury.**—Police station. County Architect.

**Cork.**—Warehouse in Hanover Street. Architects, Chillingworth and Leve, 11 South Mall.

**Dundee.**—Cinematograph theatre.

**Eccles.**—New co-operative stores.

**Edinburgh.**—Electric lighting of proposed Mining Rescue Station. Clerk, Heriot Trust, 20 York Place.

**Leek.**—Houses in Shirburn Road. (The Corporation is specially extending the mains.)

**Wellingborough.**—Factory and offices for Ideal Clothiers, Ltd. Architects, Sharman & Archer.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Dublin.**—The tender of the General Electric Co. has been accepted for both prepayment and ordinary meters, upon the terms of their existing contract.

**Keighley.**—Tenders for a 750-kw. rotary-converter and transformer at £1,595, and two water-tube boilers at £5,067, have been accepted.

**Leeds.**—A tender for a 13,000-kw. turbo-alternator and condensing plant at £34,160 has been accepted, subject to the necessary sanction to the loan.

**London: L.C.C.**—The Fire Brigade Committee recommends the acceptance of a tender by Mossay & Co., at £807, for an electrically-driven chassis for carrying a turntable ladder. If this chassis is satisfactory, an additional one will be ordered within three months at £727, or two at £1,389.

The following tenders have been received for rotary converters: Dick, Kerr & Co., at £13,065 10s.; Bruce Peebles & Co., £13,092; British Westinghouse Co., £14,196 5s.; General Electric Co., 14,261; The B.T.-H. Co., £14,377; Siemens Bros. Dynamo Works, £16,274. The tender of Dick, Kerr & Co. is recommended for acceptance.

The following tenders have been received for static transformers: British Electric Transformer Co., £5,695; B.T.-H. Co., £5,916; British Westinghouse Co., £6,166 and £6,011 (alternative); Johnson & Phillips, £6,419 12s.; Bruce Peebles & Co., £7,005; Siemens Bros. Dynamo Works, £8,420. The tender of the British Electric Transformer Co. is recommended for acceptance.

**Salford.**—A contract has been placed with Chamberlain & Hookham for meters.

Among contracts recently placed with E. Bennis and Co., Ltd., are two chain grates for Wimbledon, two stokers with self-cleaning compressed air furnaces for Burton-on-Trent, and two chain-grate stokers for Altrincham.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the price of electrolytic copper bars, c.i.f. port of arrival, quoted on Tuesday night, was £60 10s. to £61. (Last week, £62 15s. to £63 5s.)

**Works Holidays.**—We have received notice of the closing of the following works for summer holidays: Edison & Swan United Electric Light Co. (Ponders End), August 1st to August 10th; Electrical Apparatus Co., Ltd. (Vauxhall Works, South Lambeth Road, S.W.), Electromotors, Ltd. (Openshaw, Manchester), and Balcke & Co., Ltd., August 1st to 9th.

**Change of Telephone Number.**—The telephone number of the British Thomson-Houston Co.'s premises at Mazda House, 77 Upper Thames Street, E.C., has been changed to Central 10434 to 10438. Two additional lines have been installed.

**Power Gas Corporation.**—Mr. J. F. Pasley, of the Head Office of this firm, has been appointed representative for Lancashire, with headquarters in Manchester. Mr. F. G. Fogg, late North-East Coast representative, has been appointed London representative at 39 Victoria Street, S.W.

## APPOINTMENTS AND PERSONAL NOTES

The King has conferred the distinction of the Honorary Knight Grand Cross of the Victorian Order upon Mr. G. Marconi.

Mr. A. M. Kissack, Charge Engineer at the Stoke-on-Trent power-station, has resigned. By a re-arrangement of the staff the vacancy is to be filled without advertising for a successor. Mr. A. T. Gilbride has been appointed Charge Engineer, at a commencing salary of £120, with two increments of £5 per annum; Mr. H. V. C. Cotton has been appointed Charge Engineer at the Longton Works, at a salary of £2 per week, and Mr. J. Bickerton has been appointed Shift Engineer at the Burslem Works at £1 12s 6d. per week.



Mr. W. H. Dixon, of Southampton, has been appointed Chief Lecturer in the Electrical Engineering Department at the Salford Technical Institute (in succession to Dr. W. G. Rhodes, resigned), at a salary of £225, rising to £300 per annum.

Mr. R. P. Yates, of Gillespie & Beales (Amberly House, Norfolk Street, Strand, W.C.), was married to Miss D. Liddetter, at Halifax, on Thursday last. A canteen of cutlery and table silver was presented by the staff of Gillespie & Beales and the British Electric Equipment Co.

The Station Engineer and Mains Superintendent at Aberdeen have been granted increases of salary of £25, making £250 in each case.

A Shop Foreman is required by Burnands, of Sheffield. (See advertisement on another page.)

### LOCAL NOTES

**Barrow-in-Furness: Hiring-Out Apparatus.**—In his annual report for the past year (we gave the figures relating to the undertaking in our issue for June 18th, p. 354), Mr. H. R. Burnett, the Borough Electrical Engineer, states that the demand for apparatus on hire continues to increase, and that the rentals obtained leave a substantial balance after paying all expenses, and providing for depreciation on a liberal scale. Attention is also called by Mr. Burnett to the scheme of supplying small houses, of which he spoke at the I.M.E.A. Convention when discussing Mr. Bowden's Paper (ELECTRICAL ENGINEERING, June 25th, p. 365). The progress of this system has been accelerated at Vickerstown by an arrangement with the Isle of Walney Estates Co.

**Carlisle: Deficit on Electricity Undertaking.**—A deficit of £200 on the past year's working of the electricity undertaking, against a profit of £1,500 in the previous twelve months, was reported at the last meeting of the Council. This result, however, was more or less anticipated at the commencement of the year in consequence of the increase in the price of coal, the enormous increase in rates, together with increases in wages. At the same time, it is not felt that the position is one for serious alarm, and it is certainly not one for which the Engineer can be blamed. The Chairman of the Electricity Committee paid a tribute to the manner in which the works have been maintained, and also pointed out that the units sold, the maximum demand, and the income were the highest in the history of the undertaking. Furthermore, the Chairman expressed the fullest confidence of the Committee in the Engineer, and the soundness and ultimate success of the undertaking.

**Darlington: Increase in Electricity Output.**—The Electricity Committee reports a satisfactory increase in the units sold last year, compared with the previous twelve months. The increase for lighting was 18 per cent., and for power purposes 30 per cent.

**Grassington: Water Power v. Oil Engines.**—Owing to interruptions in the supply caused by the insufficiency of water at the power station, the local electric lighting company, which has hitherto depended upon water supply for driving its generator, is installing an oil-engine.

**Keighley: Plant Extensions.**—In connection with the acceptance of the tenders referred to in our "Tenders Received and Accepted" column, several members of the Council voted for an amendment to refer this back for further consideration, and also in order that outside expert opinion should be obtained upon the electrical undertaking generally. The amendment, however, was lost.

**Oldham: The Late Mr. S. W. Newington.**—At the last meeting of the Electricity Committee, the Chairman paid a high tribute to the ability and capability of the late Mr. S. W. Newington during the many years he had held the position of Borough Electrical Engineer. He emphasised the fact that it would not have been necessary to call in an outside expert with regard to the electrical undertaking, but for Mr. Newington's illness.

**Port Glasgow: Electric Supply.**—It is anticipated that the laying of the necessary cables by the Greenock Corporation for supply in this district, will be completed within the next three or four months.

**Redditch: L.G.B. and Resident Engineer.**—At the recent L.G.B. inquiry the Inspector expressed himself unfavourably towards a proposal that the Borough Electrical Engineer should receive a special fee of £300 as remuneration for acting as Resident Engineer under Messrs. Handcock & Dykes, the

Consulting Engineers, during the extension works to be carried out. In consequence of this the Council has rescinded the resolution to pay this sum of money, and an arrangement has been made with Messrs. Handcock & Dykes to remunerate the Borough Electrical Engineer for acting as their Resident Engineer for the extensions.

**Wolverhampton: Progress of Electrical Undertaking.**—A net profit of £8,677 is shown by the accounts of the electricity undertaking for the past year, in spite of an increase in the cost of coal and an increase in the assessment, the latter creating an additional burden of £1,000 per annum. Of the balance available it is proposed to transfer £2,125 to relief of rates and place the remainder to reserve.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Newcastle-on-Tyne Electric Supply Co.**—An interim dividend of 2½ per cent. has been declared on the ordinary shares.

**County of Dorset Electric Supply Co.**—This company, which was formed some time ago to supply electricity in Lyme Regis, Dorchester, Swanage, and Blandford, has not yet got into full working order. Nevertheless, the results to date are fairly satisfactory, the number of consumers in the four towns being 256, notwithstanding that two of the undertakings have only been in operation a short time, and that one is not yet working. The directors contemplate issuing a further £15,000 capital to meet the requirements of the company.

**Yorkshire Electric Power Co.**—The full interim dividend on the 6 per cent. preference shares has been recommended, together with 2 per cent. on the ordinary shares.

### NEW COMPANIES

**UNITED STATES RAILLESS ELECTRIC TRACTION CO.,** Finsbury Pavement House, E.C. Capital £1,000.

**BACHELET LEVITATED RAILWAY SYNDICATE, 11,** Waterloo Place, S.W. Capital £50,000. To enter into an agreement with Emile Bachelet. It will be remembered that the Bachelet Levitated Railway, Ltd., was registered a short time ago, and issued a prospectus, but did not go to allotment owing to lack of support.

**ELECTRICAL SALES PROMOTION,** Craven House, Kingsway, W.C. Capital, £1,000. To prepare and design advertising and other trade literature for dealers in electrical goods and appliances, &c.

**BRITISH ELECTRICAL ACCESSORIES, 17 and 19 Facet Road, Bradford.** Capital, £1,000. To take over the business of an electrical supplies factor carried on by C. Pullan at 80 King's Parade, Bradford.

**ECONOMIC ELECTRIC, 64 London Road, Twickenham.** Capital, £10,000. To take over the existing business of the Economic Electric Co.

**Electrical Fatalities.**—A man named C. A. Gale received a fatal shock at the Cornbridge Road sub-station of the Cardiff Corporation Electricity Department last Thursday. The man, who was well accustomed to the class of work, was coupling up low-pressure leads to a transformer in a pit, and in endeavouring to make a sharp bend in the cable (which, of course, was dead) he forced it against a temporary high-pressure cable, doing mechanical damage to the latter and so receiving the full 2,500 volts. The effect was made all the worse by the fact that he was leaning against the earthed transformer tank. Unfortunately he had his thumb on the brass thimble at the end of the low-tension cable. Had he held it a little lower, probably he would have been protected by the insulation. Rubber gloves were provided for him, but as he was not at the time working on a live cable he did not consider it necessary to use them. We understand that this is the first fatal accident since the inception of the undertaking.

On Saturday last a man named A. W. Harris, who was working on a 5,000-volt switch panel making alterations without having had the panel made dead, touched a live part and received a fatal shock at the works of the Eyelet Co., Nechells, Birmingham.

Another fatality occurred on Tuesday of last week at the North Eastern Marine Engineering Co.'s Works, South Dock, Sunderland, when P. Cornforth, in starting an electric hammer, accidentally touched some 240-volt terminals which were unprotected, contrary to the Factory Regulations.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 397 [VOL. X., No. 32]  
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THURSDAY, AUGUST 6, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE limiting temperatures for the safe working of generators and transformers are discussed in the Questions and Answers column. (Page 440.)

FROM the district reports of the Inspectors of Mines we gather that nearly half the mines in the kingdom use electric power, and that motors aggregating over 500,000 h.p. are installed. The use of electric safety lamps is rapidly increasing, nearly 40,000 being already employed. There were 18 fatal accidents due to electricity during 1913. (Page 441.)

THE equipment of a Yorkshire colliery in which electric power is used exclusively is described. (Page 442.)

ANOTHER article describes the electrical equipment of a Scottish colliery. (Page 442.)

DEMONSTRATIONS have recently been given with a new form of electrical fire-damp indicator. (Page 442.)

A NEW system of audible and visual mine shaft signalling designed to comply with the new regulations is described. (Page 443.)

AMONG the subjects of patent specifications of interest to mining electrical engineers published during last month are electric safety lamps combined with gas detectors and signalling apparatus for haulage work. Several specifications relating to electric furnaces have also been published. (Page 443.)

AN illustrated article describes an explosion-proof circuit breaker for mining work. (Page 444.)

SOME notes are given on the C.M.B. system of electric colliery main shaft winding. (Page 444.)

A MEMBER of the Institution of Electrical Engineers proposes the formation of a register of electrical engineers willing to undertake emergency Government service. (Page 445.)

THE Patent Specifications published last Thursday include a system of electric ship propulsion. A method of preparing tungsten for lamp filaments, a method of controlling meter switches, and a system of bus-bar protection by reactances. (Page 446.)

A VERY ingenious design of circuit breaker with thermal time limit control is described. (Page 447.)

THE new automatic signalling equipment on the Central London Railway presents several points of interest. (Page 447.)

ALL wireless telegraph service is now in the hands of the Government.—We describe some experiments in the control of fog signals by wireless.—Telegraphic communication to and from the Continent is considerably disorganised, and there is censorship and delay. The use of codes is prohibited in most cases.—A committee of technical experts is at present considering the question of high-speed telegraphy. (Page 448.)

WE give an illustration of the new Ediswan show-rooms in our Trade Section, in which a new form of metal filament lamp and a train-lighting equipment are also described. (Page 449.)

ROTARY-CONVERTERS are required at Sunderland; an electric organ-blowing equipment at Southport; street-lighting apparatus at Brighton; new generating plant at Grimsby (£30,000); a large quantity of meters in Australia; mains at Walsall; and plant extensions at Cleckheaton (£8,000). (Page 450.)

AN important report has been made upon the Southampton electricity undertaking by Sir John Snell, who endorses the policy hitherto advocated by Mr. Street, the Borough Electrical Engineer, including the charge of ½d. per unit for cooking, &c.—The dispute between the electrical contractors and the Southport Electricity Committee still continues.—Complaint was made last week that the Liverpool City Electrical Engineer had accepted a fee for services rendered to a neighbouring authority.—Satisfactory progress is reported by a number of municipal electrical undertakings for last year, and the question of the relief of rates from profits is still the subject of much difference of opinion. (Page 452.)

WE are not publishing our usual fortnightly cartoon to-day.

**Export of Carbons Prohibited.**—A proclamation published in the *London Gazette* yesterday prohibits the exportation from Great Britain of searchlight carbons.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1403.

In a trolley scheme erected on steel girders with an overhead trolley and return rail system, the rail is connected to the negative of the dynamo. Total length of track 500 yards. What should be the maximum drop? What tests should be carried out to ensure that the leakage current is not excessive, and what is the best type of indicator or recorder to instal, so that records of the leakage current can be taken? There are a large number of gas mains in the neighbourhood of this trolley.—DOCTOR.

(Replies must be received not later than first post, Thursday, August 13th.)

### ANSWER TO No. 1,401.

As a charge-engineer of a generating station, what would you consider the minimum temperature of the coils of a generator or transformer at which you should report that something was wrong? (A) In the case of cotton insulation. (B) In the case of mica or micanite insulation.

The first award (10s.) is made to "W. H." for the following reply:—

**D.C. Generators, Cotton Insulated.**—It would only be possible to take temperature readings on the field coils. After continuous running at full load, the temperature on the fields would be approximately 40° C. above the atmosphere. Most electrical manufacturers would guarantee 25 per cent. overload on their machines for a period of two hours, and this would produce a temperature rise of approximately 55° C., so that any temperature rise above this would indicate either a serious overload, or that part of the shunt winding had become short-circuited. Assuming the latter not to be the case (this would be indicated by bad operation); it would not be wise to allow the temperature rise to go any higher than about 65° C. This, with an atmosphere temperature of 25° C., would give an actual temperature of 90° C., and cotton will actually char if kept at a temperature of 90° C. for any length of time.

It is, of course, impossible to obtain mica insulated small wire suitable for shunt field windings.

**A.C. Generators with Revolving Armatures.**—These would come under the same ruling as above, excepting where a bar-wound mica insulated field winding was used, and in such cases the permissible temperature rise could be increased to 75° C. Assuming an atmospheric temperature of 25° C., this would give a resultant temperature of 100° C., which would not be injurious to the mica, but would indicate very serious overloading.

**A.C. Generators with Revolving Field.**—The same ruling as given above would apply.

**Transformers.**—Here, again, the limits given above for cotton insulation will apply, but for mica insulation a little higher temperature may be allowed, say, 110° C. actual, as a transformer will usually stand greater overloads than rotating machinery, and there is again no fear of the insulation giving trouble through excessive temperature.

"A. G. R.," to whom the second award (5s.) is made, writes:—

If cotton and fibrous insulated windings are subjected continuously to a temperature above 90° C. the insulation becomes charred and mechanically weak, and, although it may still show fairly efficient electrical properties, the slightest mechanical strain causes crumbling of the insulation, and hence increased possibility of breakdown. Mica, on the other hand, will stand a temperature of 120° C. without the slightest sign of deterioration, but at this temperature ageing of the iron circuits is accelerated and the core losses are appreciably increased.

The following table gives the maximum working temperatures for electrical apparatus as fixed by the Standards Committees in various countries. All the temperatures are in degrees Centigrade.

Description.	British.		Ameri- can.		German.			
					Cotton.		Paper.	Mica.
	$T_T$	$T_R$	$T_T$	$T_R$	$T_T$	$T_R$	$T_T$	$T_R$
Windings—Stationary	—	85	75	75	—	95	—	105
„ Moving	75	85	75	75	85	—	95	—
Commutators ...	—	—	80	—	—	—	—	95
Collector rings ...	—	—	90	—	85	—	95	—
Transformers ...	75	75	75	75	95	—	105	—
Railway motors—								
1 hr. rating	—	—	—	—	105	105	115	135
Squirrel-cage rotors...	—	—	80	—	85	—	105	—

$T_T$  refers to thermometer readings, and  $T_R$  to temperatures calculated by increase in resistance of conductors. To obtain temperature rises (maximum), the air temperature is taken as 25° C. for British and American, and 35° C. for German standards.

The usual practice in this country is to fix the safe limit for practically all types of insulation as 60° C. for machines and 70° C. for transformers, which figures, assuming an average air temperature of 20° C., give rises of 40° C. and 50° C. respectively. The temperature rises are generally measured by thermometer in the case of machines, and by increase in resistance of the windings in transformers.

[Stated briefly, so far as the charge engineer is concerned, the following actual temperatures may be taken: Cotton insulation 170 to 180° F. (76½ to 82° C.); mica or micanite 200 to 220° F. (93½ to 104½° C.). The lower figure in each case may be taken for generators, and the higher figure for transformers.—Ed. E.E.]

**The Electrical Industry of Japan.**—A Paper on the present state of the electrical industries in Japan by Prof. Kincura is published in the *Journal of the Society of Arts*. Water power, he says, is plentiful and widely distributed. Out of a possible 10 million horsepower only 300,000 is at present included in present schemes, of which about half is in actual operation. Electrical plant is made in Japan to a considerable extent, but a good deal is imported. The author says that more co-operation between foreigners and the Japanese is desirable in the importing businesses. He also encourages the acquisition of patent rights in Japan. The two largest factories of electrical plant are one in connection with the American General Electric Co. and another forming part of a dockyard. There is also an electrical factory adjoining and in connection with a copper mine. In all cases special iron and steel parts are imported. There are a considerable number of factories turning out the smaller pieces of apparatus. Both carbon and metal filament lamps are made in Japan, as well as porcelain insulators, and the manufacture of micanite from mica from Corea and Manchuria is being commenced. The manufacture of electrical instruments is not highly developed, and there is no regular electrical research laboratory in the country. Supply meters are examined by the Teishinsho, a department of communications, and last year the number reached 38,000. Wires and cables are made to an extent which almost excludes importation; dry cells are made on a small scale, as well as the simpler kinds of arc lamp carbons. Most of the public telephone apparatus has been supplied by two firms, one purely Japanese and the other in close connection with the West. Domestic electric light fittings in Japanese taste are rapidly developing. Domestic applications of electricity other than lighting are hardly used at all.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Published on the First Thursday of each month

### REPORTS OF THE INSPECTORS OF MINES

**A** GOOD many references to electrical matters are contained in the reports of the Inspectors of Mines for the different districts for 1913.

#### Scotland.

Mr. W. Walker gives the number of electric coal-cutters in his district as 700 (including 484 disc and 191 bar machines), as compared with 176 compressed-air machines. The electrical cutters have increased by 107, and the compressed-air cutters have decreased by two since the previous year. Four persons were killed and 11 injured by electric shock during the year. All the fatalities were underground. One was due to faulty insulation on an old unarmoured cable, one to an open switch-box being alive in error, one to a defective earthing system, and the other occurred on a 500-volt lighting circuit with unarmoured cable. Of the non-fatal accidents, six were due to failure of insulation of cables, the inspection of which, says the inspector, is sadly neglected at some mines. Two occurred while fuses were being replaced, two were due to carelessness, and one to pure mischief. The remaining two were on the surface, one due to measurements taken on conductors which were not realised to be alive, and the other to an apprentice touching a fuse with another wire to see if it was live. Three cases of prosecution for offences against safety provision as to electricity resulted in fines. With regard to the regulation as to telephones, Mr. Walker reports that this is gradually being complied with, but some difficulty has arisen in getting a supply of the necessary apparatus. 1,160 electric safety lamps are in use in the district, against 286 in the preceding year. These are of the following makes:—Gray-Sussman, 107; C.E.A.G., 895; Float, 19; Oldham, 55; Wolf, 62; Cremer, 10; others, 12. The aggregate h.p. of motors in use in mines in the districts is 119,639 in the 319 electrically equipped mines, of which 93,361 are underground.

#### Northern District.

Mr. J. R. R. Wilson reports the use of 134 electric (56 disc, 31 bar, 44 chain, and 3 percussive) and 530 compressed-air coal-cutters. There were six underground non-fatal electrical accidents in the district, and five on the surface, but no fatalities due to electrical causes. The inspector remarks that, considering that the use of electricity underground has increased during the year from 64,583 to 79,422 h.p., this result cannot be called unsatisfactory. Under the heading of dangerous occurrences, a fire is reported in a motor room, probably due to lighting cables enclosed in wooden casing. Two workmen were charged during the year with contravention of the rules as to electricity and convicted. 6,662 electric safety lamps are reported as being in use in the district. These are of the following makes:—C.E.A.G., 627; Oldham, 137; Gray-Sussman, 5,715; Wolf, 35; various, 148. The aggregate horse-power of motors in the 272 electrically equipped mines in the district is given as 64,837 on the surface and 79,422 underground.

#### Yorkshire and North Midlands.

Mr. T. H. Mostram reports the use of 331 electric (including 146 disc, 83 bar, and 102 chain machines) and 342 compressed-air coal-cutters in his district, compared with 290 and 311 respectively for the preceding year. The accidents due to electricity were 5 fatal, including 6 deaths, and 5 non-fatal underground, and 2 fatal and 4 non-fatal on the surface. One of the surface fatalities was due to accidental contact between a wire rope and an unprotected switch, and the other to a lad taking hold of a live conductor deliberately after being warned. One of the underground fatalities was due to a man who had tripped grasping an unarmoured 440-volt lighting wire and pulling it out of a connector. In another case an unearthed lamp guard became live through abrasion of insulation. A further fatality was due to a faulty switch on a badly earthed coal-cutter. In another case, a man in falling severed an earth wire, and also came in contact with a live lead; and the remaining underground fatality, in which two men were killed, a broken controller finger caused a badly earthed coal-cutter frame to become alive. The non-fatal accidents were due to various causes. Fines were inflicted in two prosecutions of officials under the electrical rules, and there were five convictions of workmen for offences under this heading. 25,004 electric safety-lamps are reported in the district, consisting of the

following makes:—C.E.A.G., 19,358; Oldham, 1,204; Wolf, 241; Tors, 6; Gray-Sussman, 4,091; Perfected, 43; Bristol, 8; Pape, 1; Float, 1; various, 51. The aggregate horse-power of motors in the 320 electrically equipped mines of the district is given as 51,245 underground and 55,954 on the surface.

#### Manchester and Ireland.

Mr. J. Gerrard reports 11 electric coal-cutters in the Lancashire district and 2 in Ireland. Compressed-air machines are much more widely used in Lancashire, where the number is 196, but there are none in Ireland. One non-fatal accident underground and two on the surface are attributed to electricity. Among "dangerous occurrences," a fire at an electrical resistance is reported. Five haulage hands were fined for endangering life by "larking" with a wire attached to a lamp terminal. 1,216 electric safety lamps are reported to be in use in the district, of the following makes:—Gray-Sussman, 13; C.E.A.G., 420; Cremer, 2; Wolf, 4; Tors, 8; Pape, 2; Thomson Rothmell, 4; Oldham, 759; other makes, 4. The aggregate h.p. of motors in Lancashire is given as 7,938 underground and 5,382 on the surface, and in Ireland 24 underground and 5 on the surface. There are 69 electrically equipped mines in the Manchester district and 4 in Ireland.

#### Liverpool and North Wales.

Mr. A. D. Nicholson reports 23 (5 disc, 15 bar, and 3 chain) electric and 158 compressed-air coal-cutters in the district, against 24 and 124 respectively for the preceding year. There were no electrical accidents of any kind. 385 electric lamps, composed of the following makes, are reported to be in use:—Sussman, 166; Meco, 1; Oldham, 26; C.E.A.G., 190; Wolf, 2. The aggregate h.p. of motors in the 62 electrically equipped mines of the district is given as 12,900 underground and 4,495 on the surface.

#### South Wales.

Dr. W. N. Atkinson reports 36 electric (2 disc, 31 bar, and 3 chain) and 79 compressed-air coal-cutters in his district. There was one underground fatality and one on the surface, and four underground and six surface non-fatal accidents, due to electricity. The fatal underground accident was due to faulty earthing of a pump motor. 2,716 electric safety lamps are reported to be in use in the district, including the following makes:—C.E.A.G., 2,452; Gray-Sussman, 148; Oldham, 70; Float, 22; Wolf, 19; Ackroyd and Best, 5. The aggregate h.p. of motors is given as 91,236 underground and 90,581 on the surface in the 294 electrically equipped mines of the district.

#### Midland and Southern District.

Mr. H. Johnstone reports the use of 70 (29 disc, 20 bar, and 21 chain) electric and 105 compressed-air coal-cutters in his district. The accidents due to electrical causes include two fatal and four non-fatal underground, and one non-fatal on the surface. One fatality was due to a cable from which the insulation had become stripped off by the strings by which it was suspended, and the other was due to a misunderstanding, whereby current was switched on while a man was working on some cables. The inspector writes that every one of the non-fatal accidents could have been prevented had proper care been exercised. One mine-owner was convicted and fined for 18 contraventions of the electrical regulations, and one other prosecution resulted in a fine in one out of three charges brought. 680 electric safety lamps are reported to be in use in the district, of the following makes:—Gray-Sussman, 43; C.E.A.G., 295; Oldham, 169; Bristol, 17; Cremer, 1; Float, 4; Salvator, 2; Wolf, 140 others, 9. The aggregate h.p. of motors in the 132 electrically equipped collieries of the district is given as 9,140 on the surface and 35,294 underground.

Summarising some of the above figures, it will be noted that there are in all 1,307 electric coal-cutters in use against 1,587 driven by compressed air. There have been twelve fatal accidents underground and six on the surface, due to electrical causes, and twenty-six underground, and twenty surface non-fatal electrical accidents during the year. 37,823 electric safety lamps are in use, and the horse-power of motors installed aggregates 345,266 underground and 282,827 on the surface. 1,472 collieries are electrically-equipped out of the total of the 3,302 in the United Kingdom.



## AN ELECTRICALLY WORKED COLLIERY

THE Yorkshire Branch of the National Association of Colliery Managers paid a visit recently to the Ledston Colliery of the Micklefield Coal and Lime Co., and a Paper describing the equipment of this and another of the Co.'s pits was read by the Manager, Mr. J. G. Linneker. The great feature of interest in the Ledston Pit is that it is worked entirely by electric power from the 10,000-volt overhead mains of the Yorkshire Electric Power Co. This supply is transformed down to 2,000 volts for most purposes, and to 400 volts for pumping, haulage, and lighting at a sub-station adjacent to the compressor house, wherein is situated the main distributing switchboard.

The winder in the No. 1 shaft is driven by two direct-coupled continuous-current motors, each rated at 400 h.p., and supplied by an Ilgner motor-generator with a 9-ton fly-wheel. A separate motor-driven exciter is employed, and also an automatically-controlled motor-compressor for the brakes. The equipment is on the usual lines, and was supplied by the Lahmeyer Electrical Co. This shaft is 300 yds. deep, and a wind is made in thirty-eight seconds with an energy consumption of 2 kw.-hours. It is hoped to reduce this to 1.5 kw.-hours by the addition of balance ropes. The winder in the upcast shaft is smaller, and is driven by one continuous-current motor through 12 to 1 Citroën gear. The motor-generator in this case has no fly-wheel, but provision is made so that one can be added later if required. Steam plant was used for the sinking operations, but now the whole plant, including winding, air-compressing, haulage, pumps, and fan are run electrically. Temporary electrical pumping plant was, however, used during sinking.

The air-compressors consist of a Robey vertical compressor direct-driven by a 400-h.p. A.E.G. three-phase motor, a Belliss two-stage machine direct-driven by a 360-h.p. Sandycroft two-speed Cascade motor, and an Ingersoll belt-driven compressor, originally put down for the rock drills used for sinking, and now used only during week-ends, &c. The permanent pumps comprise a Mather & Platt turbine pump to deliver 100 gallons per min. against a head of 30 ft., and driven at 2,900 r.p.m. by a 70-h.p. induction motor in No. 1 shaft and a two-stage turbine pump delivering 200 gallons per min. to a height of 180 ft., driven by a 30-h.p. motor at 1,440 r.p.m., in No. 2 shaft. Ventilation is by an 18-ft. Walker fan, rope-driven by a 360-h.p. A.E.G. motor of a special three-phase commutator type, of which the speed can be varied between 260 and 600 r.p.m. by shifting the brushes. Other examples of electric power are in the driving of a rope-way to the screening plant, and the screening plant itself. In all, the motors aggregate 2,875 h.p., and the energy consumption per month is about 200,000 units.

## ELECTRICAL EQUIPMENT AT A SCOTTISH COLLIERY

A PAPER by Mr. A. M. Russell, published in the Transactions of the Mining Institute of Scotland, describes the sinking and equipment of the Blairhall Colliery of the Coltness Iron Co., near Dunfermline. The sinking of two new shafts, nearly 2,000 ft. in depth, was commenced in 1906. A considerable amount of water was met with, and an electrical pumping plant was installed. The first pump-room contains two sets of horizontal high-lift Sulzer-Brown-Boveri electrically-driven, six stage, turbine pumps, capable of delivering 750 gallons per minute against a 700-ft. head, each being driven by a 250-h.p. motor at 1,490 r.p.m. The second pump-room is provided with a horizontal three-throw ram pump, driven by a 100-h.p. motor at 25 r.p.m., and capable of pumping 250 gallons per minute against a head of 700 ft. The same class of pump is used at the lowest pump-house. This runs at 27 r.p.m., and can deliver 300 gallons against a head of 1,350 ft. It is driven by a 165-h.p. motor. In one of the seams an electrically-driven chain creeper is used to raise the empty tubs to a height sufficient to allow of their gravitating to each side of the pit.

In the power-house there are two Willans mixed-pressure turbines, each driving a Brown-Boveri three-phase 500-kw. 550-volt 50-cycle alternator at 3,000 r.p.m. The condenser pumps are electrically driven, and a Rateau steam accumulator capable of dealing with 20,000 lb. of steam per hour and bridging over stops of 60 seconds, deals with the supply of exhaust steam from the winding and fan engines. The remote control switchboard is fitted with a Brown-Boveri automatic regulator for controlling the voltage. The neutral points of

the alternators can be earthed through a resistance. Three-core double-armoured bitumen-insulated cables are led to the shaft through a brick-lined trench roofed with fire-clay covers. Two cables are taken down the shaft, each capable of supplying half the requirements. These cables are sectionalised at each pump-room. Switches are introduced for linking-up the different lengths of cable. The cable is of the solid vulcanised-bitumen three-core double-wire armoured type, and for the suspension of the cables in the shaft, hard-wood cleats 5 ft. long were used at intervals of 150 ft., with intermediate cleats 2 ft. long arranged at distances of 30 ft. between the others. The earthing arrangements for the pit were carefully considered. A solid copper busbar is erected in the power-house, also at each of the pump-rooms, to which all armoured, motor-frames, &c., are carefully bonded. A cast-iron heavy-ribbed earth-plate is attached to the main earth-bar at the power-station; another earth-plate is placed near the shaft-top; and earth-plates are taken from the earth-bars in each pump-chamber and immersed in the sumps, as it was found that, owing to difficulties in connection with the ground at the surface, this was necessary in order to secure an efficient earth.

An overhead line is taken to the river, from which is drawn the water-supply for the boilers and for the cooling-tower. Another overhead line is taken from the power-station to Blairhall Village for the purpose of lighting. The voltage is reduced in the village to 110, at which pressure the lighting is being carried out. The lighting at the village is equally divided across the three phases, and three 15-kilowatt single-phase transformers are to be installed.

## AN ELECTRICAL FIREDAMP DETECTOR

DEMONSTRATIONS have been given recently with a new electrically-worked firedamp detector, designed by Mr. Alfred Williams. The apparatus, which is known as the methanometer, depends on the catalytic rise of temperature of a capsule of porous stone impregnated with "platinum-black" when exposed to an atmosphere containing inflammable gas, and the novelty in the instrument appears to be in the method adopted for observing the very slight temperature rises which occur with the weak mixtures, which it is most important to be able to observe. This is done by two delicate thermo couples, one of which is in contact with the platinum impregnated capsule, and the other with a similar plain capsule. These are connected to a galvanometer which is deflected when there is a difference in temperature between the two couples, and can be graduated to read the percentage of methane direct. An important feature of the apparatus is the arrangement provided to give a slight preliminary heating to both junctions equally, in order to increase the sensitivity of the platinum-black. This is done electrically by a coil supplied from a single battery cell. A report by Prof. Silvanus Thompson shows that a considerable degree of accuracy of calculation is possible provided that the auxiliary heating current is kept constant. The readings are not affected by variations in barometric pressure. Dr. J. Erskine Murray has also reported favourably upon the apparatus.

**The Wharnccliffe Pit Disaster.**—A good deal of evidence has been heard at the sittings of the adjourned inquest during the past month with regard to the explosion at the Wharnccliffe Silkstone Colliery on May 30th. Some of this turned on the possibility of the explosion having originated in a coal-cutter, which, according to some of the evidence, was actually at work at the time. This machine was reported to be in good condition before the accident, but when examined after the explosion a crack was found. It was suggested that if this damage existed before the explosion, sparks from the motor may have fired gas within the case and communicated the flame to outside. Other evidence pointed to the machine not having been properly bolted together.

**Electricity in the Rand Mines.**—A set of tables of statistics regarding the use of electricity on the Witwatersrand has been prepared by the South African Institute of Electrical Engineers, and was presented to the Annual Congress of the South African Association for the Advancement of Science at Kimberley last month. Particulars are given of generating stations aggregating some 220,000 kw., and the way this is utilised in the various groups of mines. The following figures are the aggregate horse-powers of motors installed for various purposes:—underground pumping, 43,210; underground winding, 21,100; surface winding, 70,321; ore treatment and milling, 62,013. Reduction processes, 47,894; air compressors, 30,105.

## THE TANGENT SYSTEM OF MINE SHAFT SIGNALLING

A NEW visible and audible shaft signalling apparatus, for which great simplicity and reliability are claimed, has been introduced by Donovan & Co. (47 Cornwall Street, Birmingham), in view of the new mining regulations which came into force on July 1st, and stipulated that "in connection with every winding engine there shall be provided an appliance which shall automatically indicate in a visible manner to the winding engineman (in addition to the ordinary signal) the nature of the signal until the signal is complied with."

In this system an indicator is fixed in the winding engine house, consisting of a casing containing a number of separate compartments with glazed fronts, having metallic filament lamps and reflector fixed behind each. In front of each lamp there is a metal stencil bearing the number of the signal. Unless a lamp is burning no number is visible, but immediately a lamp lights the number of the signal stands out in bold relief. The lower compartment contains the operating relays, which are actuated by the signals sent by the banksman or onsetters. The relays are actuated by battery current, and when energised they close strong wedge contacts, cutting in the local battery supply to the signal lamps. The relays are mechanically coupled so that any signal will automatically reset any previous signal. There is thus no possibility of having two signals showing simultaneously. The apparatus can be arranged to give all the audible signals on one bell, or, if thought preferable, a distinct bell can be connected to ring from any level. An audible signal is given by bells in the usual manner. The tone of the bell informs the winding engineman as to the level sending the signal, each level having a differently-sounding gong. As a totally distinctive signal, the banksman's signal can be received on a hooter. Furthermore, the apparatus can show visually the level from which the signals are being transmitted, and in this case also the resetting would be entirely automatic, in a similar manner to the actual signals.

Under the new rules it is required that the banksman must be able to signal to the winding engineman, and also to the onsetters, and to receive further signals from the onsetters. The banksman will therefore require two sets of tappers and one set of bells. One set of tappers will contain as many keys as may be necessary to signal to the winding engineman, and the other set as many as there are levels or insets from which winding is done. The number of bells will also equal the number of levels or insets. The onsetters' outfit consists of a set of keys according to requirements, and one bell for receiving signals from the banksman. The signal tappers or keys are mounted together in a cast-iron casing, with all the terminals brought together in a convenient position for connecting. The keys are grouped in a most convenient manner, suggested by experience, No. 1 and No. 2 keys being placed at the bottom, apart from the rest, as they are required for coal-drawing. The iron casing is fitted with an iron roof and projecting sides to guard against accidental depression of the keys. If preferred, independent Morse tappers can be supplied, which can then be grouped up and fitted in positions most suitable for the particular requirements. In either case it is essential that the tapper is clearly marked with the number corresponding to the signal it is used for.

The wiring consists of multicore cable running from the farthest required point to the engine house, having as many conductors as there are signals to be sent and one common return in addition; therefore the standard equipment, as detailed above, requires a two-core cable. Another multicore cable runs from the banksman to the nearest onsetter, having as many cores as there are signalling levels; afterwards the number of cores in this cable decreases by one as the different signal points are reached. Thus, in signalling from the banksman to four onsetters, the cable to the nearest onsetter would have to be four cores, while to the last position only one core would be run.

It is important to note that in this system the number of depressions of the tapper does not affect the visual signal at all. The number of taps are merely in order to give the engineman a double means of checking the signals, because, in this system, the whole of the signal, that is, the number and nature of the signal and the point from which it is sent, appear on the indicator from the first depression of the key. Further depressions of the key simply confirm the number showing on the indicator. It therefore follows that the tangent system checks the signals, and any mistake is at once apparent to the engineman.

## MINING AND METALLURGICAL PATENTS OF JULY

### Mining.

IN specification No. 15,064, of 1913, the Accumulatoren Fabrik A.G. (Berlin) and J. F. Rüsse describe an electric miner's lamp, combined with a gas detector consisting of a small spark-gap fed by an induction coil within the apparatus, working off the same battery as the lamp. When gas is present a "halo" is produced.

An improved apparatus for electrically igniting safety lamps underground is the subject of No. 17,529, of 1913, by V. E. Joyce and Spagnoletti, Ltd. The chief feature is that the handle of the magneto generator cannot be inserted or worked unless the lamp chamber is closed.

No. 4,436/14, of E. Edward, is for a system of signalling for haulage roads, &c., in which the contacts are in gas-tight boxes, and are worked by pull wires which also form the return wires and link together adjacent contact boxes.

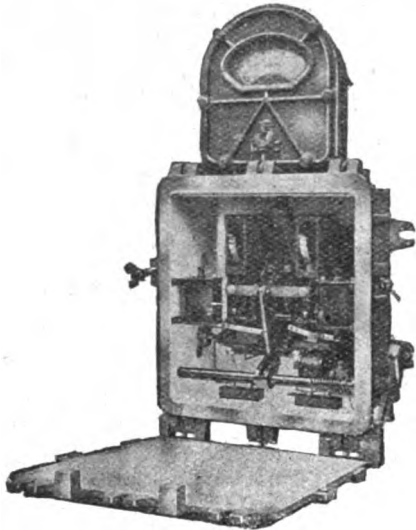
### Metallurgical.

Amongst the specifications published last month were several of interest to electro-metallurgists. No less than six of these related to electric furnaces. In specification No. 13,250/13, I. MOSCICKI, of Lemberg, describes a furnace with a rotary flame, suitable for the treatment of gases and vapours. Circular, concentric electrodes are used, one or both of which must be shaped like a truncated cone. The arc, which is alternating, is formed in a strong magnetic field, which is so arranged as to cause a rapid elongation of the flame during each alternation of the current. Owing to the conical shape of the electrodes, a lower tension can be used for maintaining the arc. Specification No. 24,850/13, by I. RENNERFELT, of Stockholm, relates to arc furnaces which are arranged to oscillate bodily about a horizontal axis in order to agitate the charge. Two sets of electrodes are provided, one at each end of the furnace, and each set consists of a vertical electrode and two horizontal or nearly horizontal electrodes projecting into the furnace from opposite sides. Twophase current is preferable, but other supply systems may be used. The same patentee also describes in specification 226/14 a furnace for the simultaneous melting of different metals in which several crucibles are arranged on the floor of the furnace and heated by centrally-located arcs, the floor of the furnace being meanwhile rotated bodily. An induction furnace, particularly adapted to the conversion of cast-iron into steel, forms the subject of specification No. 3,291/14. The patentee is P. LESCURE, of Dombrowa, and the invention consists in arranging the metal to be treated in a spiral cavity in the furnace, so that the metal itself forms the secondary of a transformer, the primary of which is situated on another limb of the transformer, outside the furnace. Provision is made for obtaining a good circulation of metal round the spiral. A furnace for fusing ferro-alloys forms the subject of specification No. 3,835/14, by the SOC. ELECTRO-METALLURGIQUE DE ST. BERON, of Lyons. It comprises a fusion chamber, in which the two main electrodes of like polarity operate. The fore-hearth is provided with another electrode of opposite polarity. Mechanism is provided to force one of the main electrodes further into the fusion chamber, so as to cause the molten metal to flow out. The other main electrode is then raised to allow a fresh charge to be introduced into the furnace, so that no interruption of the heating is necessary. In No. 6,731, of 1914, FRIED. KRUPP A.G. describes an improved method of water-cooling furnace electrodes. A method of producing a composite billet consisting of a layer of iron or steel coated on both sides with a film or layer of nickel-copper alloy, is described by the B.T.-H. Co., to whom it was communicated by the G.E. Co. of America, in specification No. 19,021/13. The union between the nickel-copper alloy and the steel is effected by interposing a thin sheet of copper between the metals, and raising the temperature to the melting-point of copper in an electric vacuum furnace, having carbon electrodes. The resulting composite billet can be rolled into sheets and used for a variety of purposes. In specification No. 10,980/14, E. A. ASHCROFT, of London, gives particulars of an improved process for the electrolytic manufacture of alkali metals. The improvement consists in the employment of an electrolyte consisting of an alkali hydroxide and an alkali cyanide with or without the addition of other salts. A machine for the production of lap-welded tubing from a thin strip of sheet-metal is the subject of specification No. 8,595/14, by the A.E.G. Co., of Berlin. Two specifications, viz., Nos. 25,393/13 and 743/14, relate to electroplating. The former is by S. COWPER-COLES, and describes an improved method of depositing a coating of

copper upon iron or steel (see *ELECTRICAL ENGINEERING*, July 9th, p. 397), whilst the latter gives particulars of an electroplating machine, having a rotatable container, which forms the cathode of the circuit, whilst the carrier for the articles to be plated is arranged so that very little plating occurs on the carrier itself.

### EXPLOSION-PROOF CIRCUIT-BREAKERS WITH INSTRUMENTS

**I**N a new range of explosion-proof circuit-breakers recently introduced by the General Electric Co. (67 Queen Victoria Street, London, E.C.), provision is made for the attachment of an explosion-proof pedestal-type ammeter. The instrument is provided with long, well-machined flanges to give the metal-to-metal joints similar to those between the circuit-breaker lid and box. The covers of these attachments are

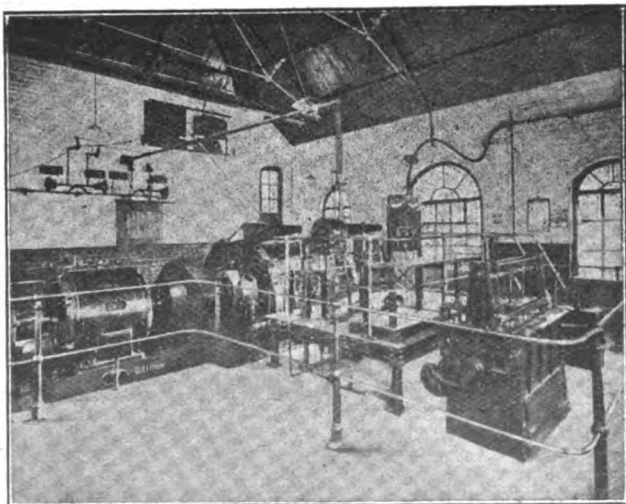


EXPLOSION-PROOF CIRCUIT-BREAKER WITH AMMETER ATTACHED.

strongly bolted on, in order to resist the effects of any internal explosion, and the strong plate-glass window has wire-netting embedded in it which, in addition to strengthening the glass, holds the pieces together in the event of breakage. The inclusion of such an attachment in explosion-proof circuit-breakers permits the connections between the ammeter and the circuit-breaker to be neatly arranged, as will be observed in the accompanying illustration.

### AN ELECTRIC WINDING PLANT

**A**N electric winding plant has recently been laid down for the Heworth Coal Co. The depth of the shaft is



ELECTRIC WINDER AT HEWORTH COLLIERY.

900 ft., and the capacity of the winder is 20 cwt. of coal per wind of two tubs. The average winding speed is 600 ft. per

min. The winding gear, which is shown in the accompanying illustration, was constructed by M. B. Wild & Co. (Birmingham), and consists of a drum 6 ft. in diam. and 5 ft. wide, with post-type brakes. Full emergency devices for applying the brakes are fitted with automatic tripping arranged to prevent over-winding. The indicator is of the vertical type, driven by bevel wheels from the drum shaft. The winder is driven through a Reich type insulating coupling by an 80-h.p. 40-cycle 625-volt "Witton" slip-ring motor running at 380 r.p.m. The design of the controller is such that the winder is completely controlled from a single lever, which performs all the functions necessary for starting, stopping, reversing, and speed regulation. Movement of the lever from the "off" position first closes the oil-immersed stator or line switches. A further movement introduces a liquid resistance into the rotor circuit until the "full on" position is reached. All the parts are mechanically interlocked, so that it is impossible for them to operate in any but the correct order. The backward motion of the lever reverses the sequence of operations. In order to dissipate the heat generated in the liquid resistance during starting up, a special cooling system has been adopted. The General Electric Co., Ltd. (67 Queen Victoria Street, London, E.C.), were the contractors for the switchgear and motors for this installation.

### THE C.M.B. SYSTEM OF ELECTRIC WINDING

**A** RECENT pamphlet issued by Crompton & Co., Ltd. (Chelmsford), on main winding machines gives some notes on their "C.M.B." patent system of control, which employs a continuous-current main winding motor in combination with a special motor-generator. The latter is so wound that the maximum demand from the mains is automatically limited, and the speed can be economically controlled from zero to full value without the use of series resistances. This feature is of particular value for running for extended periods at the slow speed necessary for shaft inspection. Full advantage can also be taken of regenerative braking. During acceleration the voltage on the winding motor gradually rises, but the current remains practically constant at its full-load value, owing to the action of the special windings on the motor-generator, independently of the rapidity of movement of the control lever. The effect of exceeding the normal load of the cage is to increase the time of the wind, but not to increase the kilowatt input.

The motor has special windings for producing a heavy torque during the starting period, and the action of bringing the controller to the "off" position converts the motor into a powerful generator, thus giving all the braking effect required to bring the drum to rest.

The controller is mechanically connected to the depth indicator, and is automatically brought to the "off" position should the driver neglect to switch off at the correct moment. Should the supply fail, or any contingency arise which might cause an overwind, provision is made for automatically tripping the circuit-breaker, which cuts off the supply and causes the brakes to be applied.

This electric braking system, besides having the advantages of economy in causing power to be returned to the mains, is much less productive of shock and wear to the gearing and other parts of the machinery than mechanical brakes, which in this system need only be applied for holding the drum at rest. The usual other safety devices are provided in connection with the depth indicator.

The alternating-current side of the rotary-converter is provided with windings permanently connected to its commutator, and is fitted with amortisseurs which pull the machine into synchronism. The set is started up by means of a plain three-pole switch, no skill being required by the operator as in the case of converters which have to be synchronised before switching on to the mains. The shunt fields of the converter are wound to give unity power-factor, a series field winding also being provided for the purpose of keeping the power-factor constant at the varying loads. The variable voltage generator which is connected in series with the rotary armature, and is excited so as to oppose or assist its voltage, is provided with limit windings previously referred to, these windings being in opposition to the shunt fields. With this arrangement the resultant field of the variable-voltage machine bears a relation to the current supplied to the main motor. The voltage of the generator is varied by altering its excitation, complete control of the main motor being obtained by this method. The main driving motor is provided with a double shunt field winding for the purpose of giving the heavy torque which is necessary at starting,

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and the regenerative braking required in order to bring the drum to rest. Complete control is effected by means of two levers of the railway signal type fixed on the driver's platform. The system is already in use in several collieries in Scotland, Yorkshire, and Durham, and in a Shropshire lead mine.

**EMERGENCY GOVERNMENT SERVICE**

THE following letter has been addressed to the Secretary by a member of the Institution of Electrical Engineers:—

Having regard to the extent and importance of military and naval services involving electrical and mechanical engineering, and to the present state of public affairs, I suggest that the I.E.E. should open a register of members able and willing to take temporary Government service, and put that register at the disposal of the Government. I enclose a suggested draft of the statement of particulars which should be on the register:—

TEMPORARY GOVERNMENT SERVICE.—MECHANICAL AND ELECTRICAL ENGINEERS.

*Offer, with Personal and Professional Particulars.*

I, ....., am able and willing to entertain proposals for temporary service under H.M.'s Government in services involving engineering duties.

(Signed) .....

Name in full .....	Postal address .....
Age .....	Notice required .....
Single or married .....	No. of dependent children .....
Health .....	Physical defects .....
Occupation .....	Employer .....
Professional status .....	Practical experience .....
Military, Naval, or Marine experience and status .....	Experience in control of men .....
Languages .....	Services offered for .....
	Specially qualified for .....

**CORRESPONDENCE**

**ELECTRIC VEHICLES.**

*To the Editor of ELECTRICAL ENGINEERING.*

SIR,—I have received a letter from the Secretary of the Electric Vehicle Association of America stating that the Association will be glad to welcome to their annual Convention in Philadelphia, which is being held on Monday, Tuesday, and Wednesday, the 19th, 20th, and 21st October, 1914, any electrical engineers in England who are interested in the electric vehicle and who propose being in the States at that time. I may say that the Electric Vehicle Committee is being represented by its Chairman, Mr. R. A. Chattock, the City Electrical Engineer of Birmingham. I should be glad to be advised of any engineers who are proposing to attend in order that I may notify the Secretary of the Association.

Yours faithfully,

F. AYTON,

*Hon. Secretary.*

Ipswich, Aug. 4th, 1914.

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# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published July 30th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad

15,199/13. **Electric Propulsion of Ships.** B.T.-H. Co. (*G.E. Co., U.S.A.*). In the system described, the propeller is driven by a motor of the Boucherot type with a short-circuited secondary winding so arranged that the secondary circuit will have a relatively high resistance when the secondary current has a high frequency, and a lower resistance when the secondary current has a low frequency. A considerable over-excitation of the alternator is used to provide for increasing the motor torque for reversing and manoeuvring. Two figures.

15,297/13. **Preparation of Tungsten for Lamp Filaments.** F. SIMPSON. In this process of preparing squirted filaments or bars for wire-drawing, the filaments or bars are dried in air, heated in dry hydrogen, re-oxidised by heating to a temperature not above 240° C. in air, and then raised to a high temperature in the absence of oxidising conditions, to bring about reaction between the oxygen and carbon in the substance, and further to cause sintering of the filaments or bars.

16,015/13. **Combined Lighting Dynamo and Starting Motor for Automobiles.** H. LUCAS and H. E. MOORE. This machine can act as a self-regulating dynamo or as a series motor. The shunt regulating winding, when it is employed as a generator, is connected between one of the main brushes and an intermediate brush, but can be put in series with the armature and battery, cutting out the other circuits when the machine is to be used as a starting motor. Four figures.

16,132/13. **Meter Switch Control.** A. PETERSEN and KEMP & LAURITZEN. A system for controlling two-rate meter change over switches or other apparatus on supply circuits by a superposed E.M.F. acting on resonance relays of a type in which the resonance is mechanical. One figure.

2,409/14. **Single-phase Motors.** SIEMENS-SCHUCKERTWERKE. Polyphase commutator motors of the type in which the rotor windings are connected to displaceable pairs of commutator brushes, and the speed is varied by reducing the inclination of the chord joining the brush position of any pair relatively to the axis of the stator winding, and then increasing it in the opposite direction as the brushes pass the position corresponding to synchronous speed. Four figures.

3,594/14. **Current Collectors for Railways.** A.E.G. A double pantograph collector in which the two contact bars are each supported on a parallelogram pivotted frame. These are so interconnected that they have common lower arms and common fixed pivots. One figure.

6,104/14. **Arc Lamp Carbons.** H. AYRTON. Cored carbons with a layer of copper round the core.

7,938/14. **Emergency Lighting.** R. DESPESAILLES. The installation is arranged with an auxiliary circuit fed by an auxiliary source of supply, which automatically comes into action on failure of the main supply. Arrangements are further provided so that, on failure of either circuit, the other can be fed from either source of supply by automatic change-over switches. Four figures.

10,004/14. **Central Station Protective Apparatus.** P. TORCHIO and H. R. WOODROW. A system of bus-bar protection in which bar coupling inductances are provided to limit fault currents, while at the same time drop in voltage is prevented by causing the fault current passing through the protective reactance to induce a voltage in series with the bus-bar voltage. One figure.

11,937/14. **Heating Apparatus.** A. F. BERRY. This specification covers improvements in construction of electric heaters of a kind in which the elements are enclosed in metal in direct contact with radiating fires. Twelve figures.

## Specifications Published To-Day

The following Patent Specifications will be published to day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free. Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** LEWIS [Electrode manufacture] 22,222/13.

**Dynamos, Motors and Transformers:** ATELIERS DE CONSTRUCTIONS ELECT. DE CHARLEROI, SOC. ANON. [Starting arrangements] 15,875/13; SIEMENS SCHUCKERT, GES. [Control of A.C. motors] 17,589/13; FULLER [Magnetic motor] 23,277/13; LEECH [Brush gear] 23,867/13; HOLLISTER [Generator regulation] 27,354/13; THOMPSON (*Goldschmidt*) [Frequency transformers] 3,252/14.

**Electrometallurgy and Electrochemistry:** SIEMENS & HALSKE AKT. GES. and HUTH [Manganese-peroxide anodes] 27,365/13; THUM [Electrolytic apparatus] 9,232/14.

**Heating and Cooking:** CLARKE [Heaters and cookers] 17,453/13; VON HENTZEL [Heaters for liquids] 373/14.

**Instruments and Meters:** C. LORENTZ AKT. GES. [Supporting stretched threads] 16,380/13; PAUL [Magnetic balances] 28,950/13.

**Switchgear, Fuses and Fittings:** WILDEY [Snap-action switch] 24,899/13; INGRANIC ELECTRIC CO. (*Cutler Hammer Mfg. Co.*) [Switches] 5,649/14; ROLPH [Switches] 9,492/14.

**Telephony and Telegraphy:** HOWGRAVE-GRAHAM [Constant speed device] 16,198/13; SIEMENS & HALSKE AKT. GES. [Automatic and semi-automatic telephony] 16,538/13; WESTERN ELECT. CO. (*Woodward*) [Code-signalling systems] 25,774/13; [Telephone systems] 2,075/14; [Automatic telephone switches] 2,693/14; GRAHAM [Telephony] 27,679/13; DWYER [Wireless oscillator] 5,281/14; A.E.G. [Condensers] 6,418/14.

**Traction:** BOIRAULT [Connections for railway vehicles] 13,820/13; KONYOUNJIAN [Dynamo-electric machines] 23,698/13.

**Miscellaneous:** PARSONS and BALL [Clocks] 15,928/13; RIGAUD [Lamp and fire-damp indicator] 16,257/13; SIGNAL GES. [Submarine signalling] 16,298/13; HODGSON [Lifts] 16,392/13; SIEMENS BROS. & CO. (*Siemens & Halske Akt. Ges.*) [Röntgen-ray apparatus] 18,673/13; DUIVEN [Electric baths] 25,668/13; ADLINGTON [Signalling apparatus] 8,975/14.

The following Specifications are open to Inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables and Wires, &c.:** WELLS [Remote control] 10,823/14; SOC. ANON. DES ETABLISSEMENTS L. BLERIOT [Control systems] 16,080/14; HALL [Motor-control system] 16,319/14.

**Dynamos, Motors and Transformers:** AKT. GES. BROWN BOVERI ET CIE. [Electrodes for vapour rectifiers] 285/14.

**Ignition:** ROLL [Spark plugs] 14,561/14; BETHENOD [Magnets] 15,487/14.

**Instruments and Meters:** CIE. POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES A GAZ [Ampere-hour meters for A.C.] 10,707/14.

**Switchgear, Fuses and Fittings:** SOC. ANON. DES AUTOMOBILES ET CYCLES PUGEOT [Safety apparatus] 14,638/14.

**Telephony and Telegraphy:** HULIMANN [Selector switches] 16,234/14; ERFORSCHUNG DES ERDINNERN GES. [Earth signalling] 16,659/14; [Exciting a Marconi antenna] 16,660/14.

The following Amended Specification may now be obtained:—  
F. TOUNSON [Earthing clip] 1,862/13.

## Opposition to Grant of Patents

11,177/13. E. R. CORWIN. **Telephone Systems.** The grant of this patent, which covers an auto-manual system of working for extensions and exchanges, is opposed.

129/14. A. WILLIAMS and L. D. WILLIAMS. **Gas Detecting Apparatus.** Opposition has been entered to the grant of this patent. The instrument utilises a catalytic body, which is heated electrically to increase its sensibility. The further rise in temperature indicating the presence of inflammable gas is detected by thermo-electric means. (This apparatus is referred to under the name of the methanometer on another page of this issue.)

## Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

14,368/00. C. DE KANDÓ. **Control of Liquid Rheostats.** The patent covers improvements in the control of liquid rheostats such as are used for the rotor circuits of three-phase motors or locomotives. The height of the liquid is controlled by compressed air, and pneumatically actuated short-circuiting switch is also used. The valves controlling these are arranged so that the rheostat and short-circuiting switch are pneumatically interlocked.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** F. W. GORE [Clutch arc lamp mechanism] 8,512/03.

**Electrochemistry and Electrometallurgy:** G. W. JOHNSON [Electrolytic preparation of dyes] 7,835/05.

**Ignition:** R. S. LOVELACE [Sparking plugs] 8,474/03.

**Batteries:** J. T. SZEK [Primary battery negative electrode] 8,660/07.

**Switchgear, Fuses and Fittings:** H. ROSE [Quick make and break switches] 8,692/09.

**Telephony and Telegraphy:** W. FAIRWEATHER [Selective signalling apparatus] 9,063/06; A. KORN [Transmission of pictures] 8,727/07.

**Traction:** E. GIRAUD [Safety device for short-circuiting line in event of breakage of conductors] 29,063-4/04.

**Miscellaneous:** C. J. FOX and R. PEARSON [Fire alarms] 8,000/05; H. E. SHEVARD [Motor-car headlamps] 25,634/09.

## A THERMAL TIME LIMIT CIRCUIT BREAKER

A NEW pattern of thermal time element circuit-breaker designed to take the place of the double pole switch and fuse for the control of small motors, &c., has been introduced by Morris & Lister, Ltd. This possesses the advantages of the time element circuit-breaker over the ordinary fuse or combined switch-fuse, while not only is it more compact, but is placed on the market at a figure which renders its substitution for the switch and fuse possible from the cost point of view. It is controlled by thermal strips of a similar nature to those used in the firm's larger type of circuit-breaker, but these are arranged somewhat differently, and are applied in conjunction with an ingenious toggle movement. The mechanism can be seen in Fig. 1, and a front elevation is shown in Fig. 2. Beneath each of the arms constituting the poles a thermal strip (A) is fixed, which is attached at each end to a brass standard. The front standard for each strip forms the contact block for the corresponding pole. These two strips act in conjunction with one another on two pins (B) placed between the strips at right angles to the length of the latter. The two pins, which are hinged together at their centre, are acted upon by the middle points of the strips, so that they are always under compression, and

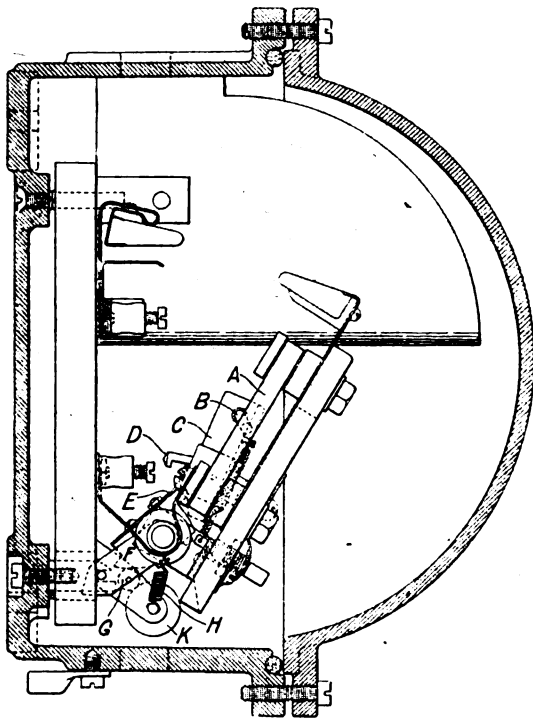


FIG. 1.—SECTIONAL ELEVATION OF CIRCUIT-BREAKER.

are thus tending to occupy one of two possible positions of the hinge. The one of these positions corresponds to the "in" position of the circuit-breaker, the other to the "out" position. The central hinge of the two pins is made up of a short insulating rod piece (C), with a small notched iron pin (D) attached at right angles near its lower extremity. In the notch of this pin, a push-in piece (E) directly controlled by the handle acts. This push-in piece is fixed parallel to the handle itself, and turns with the handle about the main axis of the breaker. When the breaker is thrown in, the push-in piece acts through the medium of the notched pin (D) and throws the circuit-breaker arms carrying the contact pieces and carbon brushes forward. The circuit-breaker arm is provided at its lower extremity with a small cam (F) forming an extension of the push-in piece, and sliding over a roller (G) forming a click, which is controlled by a fairly strong spring (H). This roller locks the cam, and with it the push-in piece and the circuit-breaker arm, in the "in" position. The effect of its action is to render the operation of the breaker almost equivalent to a quick-make, that is to say, the cam is so shaped that when the breaker arm has passed a certain point of its forward movement, the spring controlling the roller acts through the medium of the cam and tends to force the arm forward into the "in" position. This ensures that the breaker in all circumstances beds well home on the contacts in the "in" position. The cylinder (K) is a rubber buffer, which is depressed by the rear portion of

the breaker arm on coming out, and so releases the handle also.

When an overload of sufficient duration occurs, the strips expand and permit the hinged rods to spring over under the action of the spring into the second or "out" position, which operation disengages the slotted pin from the push-in piece, and so causes the circuit-breaker arm to fly out under the action of its own controlling spring. When the circuit-

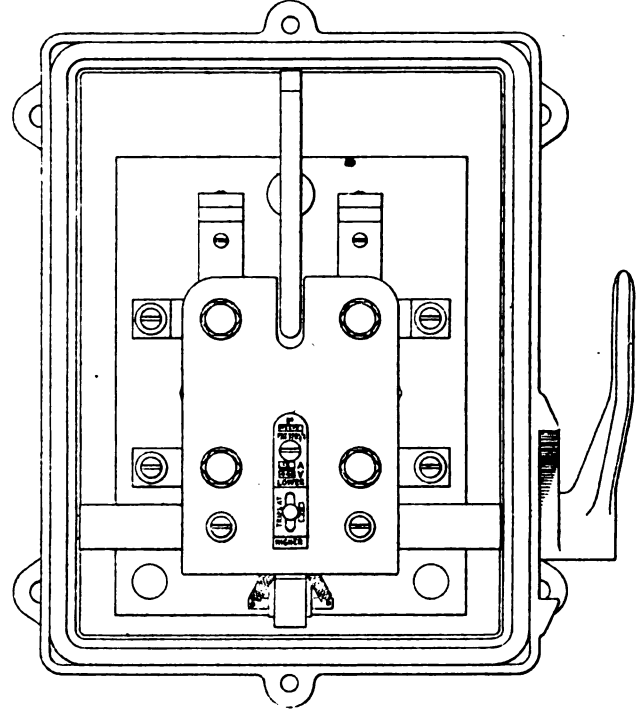


FIG. 2.—FRONT ELEVATION WITH COVER OFF.

breaker arm reaches the "off" position it depresses the roller (K), and so disengages it from the cam, whereby the handle is also brought into the "off" position. The breaker is of the loose handle type, and cannot be held in if the overload is still existent. The tension of the spring controlling the hinged pieces can be adjusted, and the rating of the breaker can thus be varied. The usual adjustment is from 75 to 125 per cent. of the normal load. The contacts of the breaker are formed by the above-mentioned brass blocks which in the "in" position of the breaker rest on carefully designed lay-on copper brushes. Substantial carbon breaks are provided.

## ELECTRIC TRACTION NOTES

The new automatic signalling of the Central London Railway, which is now complete, is described in a recent article in the *Railway Gazette*. The track circuit current in this system is alternating, and special impedance bonds, which allow the passage of the continuous power current, but not of the signalling current, are used at every section insulator. Each bond consists of a number of turns of heavy copper bar on a laminated iron core in a cast-iron case placed between the rails. Two of these coils in series, so far as the power current is concerned, but wound in opposite directions, are used. The transformers supplying the signalling current have resistances in series with them, variable resistances controlled by thermo-regulators which keep the current approximately constant as the train passes along the section. The signals on the main portion of the line have no moving parts, but are simply groups of coloured lamps controlled by the relays. The red lamps are run from a circuit of lower voltage than the green, and only one contact is used, that in the latter circuit. The red lamp is in circuit continuously, but is suppressed by the green when it is illuminated by the interaction of the two secondaries on the transformer from which both are supplied. A few electro-pneumatic arm signals are used in the Wood Lane yard. Automatic train-stops, also pneumatically actuated, are used at all stop signals. There are in all forty-seven automatic signals, fifty-three semi-automatic signals, thirteen repeaters, and eighty train-stops. Electro-pneumatic point control is in use at Liverpool Street,

but at the emergency crossings. &c., at other parts of the line, the mechanical frames have been retained, but are interlocked with automatic signals by circuit-breakers on the levers. The work was carried out by the McKenzie, Holland & Westinghouse Power Signal Co., under the supervision of the Central London Railway Co.'s Engineer, Mr. A. R. Cooper.

Iron is now used for axles in lieu of steel on the Burnley Corporation Tramways, and so far is giving good results.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The Channel and North Sea telephone cables are reserved for Government service. The Government has also assumed control of the wireless telegraph service. The use of wireless telegraphy on ships in the territorial waters of the United Kingdom is forbidden, and all vessels entering port are required to dismantle their aerials. All experimental wireless stations are to be closed, but the order does not apply to stations doing public business, such as coast stations which carry on communication with ships at sea.—The London Wireless Society has offered the Government the services of 100 of its members who are ready to act on ships.

Notices and advices with regard to interruptions of telegraph traffic have been so numerous this week that it has almost been impossible to keep track of them. It may, however, be generally accepted that telegrams between Great Britain and the Continent must be written in plain language without abbreviations whatsoever, and the wording must not be in any way curtailed in a manner which would make the meaning dubious. Messages are only accepted at senders' risk, and are subject to censorship and delay. Telegrams between Great Britain and Russia may only be written in plain Russian, French, English, or German. All telegraphic relations between Hungary and Russia, needless to say, were terminated on August 2nd. On the 3rd inst. the Dutch Government suspended the use of secret language for telegrams. On the 4th inst. code language telegrams were not admitted in Turkey. The Government of South Africa only admit tele-

grams in plain English, French, or Dutch, and they must be signed. Abbreviated addresses are not admitted, and radio as well as ordinary telegrams can only be accepted at senders' risk, and are subject to delay and censorship. Private telegrams destined to Switzerland must be written in plain German, French, or Italian, and those without text or signature are not admitted.

The Shanghai-Nagasaki cable and the Vladivostock-Nagasaki cables failed on July 29th, and telegrams for Japan were sent via Formosa at senders' risk. The La Reunion-Mauritius cable was repaired on July 29th, and the Trieste-Corfu cable was interrupted. The Shanghai-Nagasaki cable was working again on the 29th inst. For Bosnia and Herzegovina, telegrams in plain English, French, German, and Italian can be accepted, but no use can be made of commercial marks or signs, and they cannot be accepted without text. Private telegrams to Hungary, or passing Hungary in transit, can only be accepted at senders' risk. The same restrictions apply to telegrams to Greece, Russia, and Turkey. On July 31st telegrams in plain language for Vera Cruz were again permitted in any language, but subject to senders' risk. Telegrams for the Far East, Straits Settlements, and India can only be accepted via Eastern. On the 1st inst. the Indo-European lines between Emden and Berlin were down. The land line between San Domingo and Puerto Plata was interrupted on the 2nd inst., and traffic to and from San Domingo, Curaçao, and Venezuela are subject to great delay. Messages are being sent by boat to Puerto Rico. The Cape Saint Jacques-Doson cable was restarted on this date.

In the House of Commons last week Major Archer-Shee asked the Postmaster-General why no technical expert had been appointed on the Committee to examine into the organisation of the telegraph service (*ELECTRICAL ENGINEERING*, July 23rd, p. 421), and suggested that an engineer of repute and practical experience in telegraph work should be added to the Committee. The reply was that this Committee is concerned more particularly with the commercial aspects of the telegraph service, and that in the circumstances the Postmaster-General does not think it necessary to appoint a technical expert as one of its members. A separate Committee mainly composed of technical experts is at present considering the question of high-speed telegraphy, the principal technical problem of the telegraph service.

## "ELECTRICAL ENGINEERING" TRADE SECTION

— Notes on Tenders Invited and Prospective Business appear on p. 450. —

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**POCKET LAMPS.**—Messrs. Drake & Gorham, Ltd., have issued a very full list of pocket battery lamps in all sizes and prices from 18s. per doz. (complete with case, battery, and lamp) upwards. The great utility and popularity of these pocket lamps and torches since the metal filament lamp has made it possible to utilise very small batteries with comparatively long life, has resulted in an enormous number of sizes and patterns being available and the list in question offers a wide selection.

**CARBON LAMPS.**—A new price list of B.T.H.-Edison carbon lamps has been issued by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), in which some interesting results of tests are given.

**LUMINOUS BELL INDICATOR SYSTEM.**—A well-thought-out luminous bell indicator system for hotels, &c., is described in a pamphlet from the Sterling Telephone and Electric Co., Ltd. (210-212 Tottenham Court Road). Each room is provided with three pushes, which control coloured lamps over the door of the room and at suitable service points, and these can only be extinguished at the actual door by the servant attending to the call.

**KETTLES.**—A full range of about forty different designs of electric kettles is listed in an illustrated leaflet from the British Prometheus Co., Ltd. (Salop Street Works, Birmingham).

**SUCTION CLEANER.**—A leaflet from the Electrical Engineering and Equipment Co., Ltd. (109-111 New Oxford Street, London) describes the "Bee" electrically driven suction cleaner, which is intended for the use of householders who have an electric supply. By the use of extra attachments, it may be employed for a variety of purposes.

**ENAMELLED WIRE.**—A leaflet from the Sterling Telephone and Electric Co., Ltd., deals with enamelled wire multiple cables for various intercommunication telephone systems.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**GAS PRODUCER PLANT.**—The Power Gas Corporation, Ltd. (Stockton-on-Tees), have just issued two different illustrated pamphlets of different sizes describing their Mond gas-producer plants with and without ammonia recovery apparatus, and their suction and suction-pressure types of plants for power and heating.

**HEATING AND COOKING APPARATUS.**—Some attractive new designs of kettles, hot-water cans, coffee machines, hot-plates, and other pieces of electric heating and cooking apparatus are illustrated in a new leaflet from Krupka and Jacoby, Ltd. (59 Victoria Street, S.W.).

**MOTOR CONTROL.**—The push-button system of motor control of the Igranic Electric Co., Ltd. (147 Queen Victoria Street), is described in a booklet entitled "The Compulsion of Utility."

**THE UNION QUARTERLY.**—The first issue of this new Journal of the Union Electric Co., Ltd. (Park Street, South-west), contains an article on the works where the company's dynamos and motors are made, and descriptions of novelties and other matters of engineering interest.

**ALUMINIUM.**—A leaflet from the British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), contains a reprint of an article on an overhead aluminium network feeder by Mr. E. P. Austin, which appeared recently in *ELECTRICAL ENGINEERING*.

**DRILLS.**—A catalogue from E. Duisberg (28 Victoria Street, S.W.) describes the latest patterns of twist drills made by Günther & Co.



### THE NEW EDISWAN SHOW-ROOMS

THE EDISON & SWAN UNITED ELECTRIC LIGHT Co., LTD., have selected an admirable situation for their new City showrooms, at 123-125 Queen Victoria Street, E.C., and the showrooms themselves are in every respect just what showrooms should be. The fine frontage in Queen Victoria Street and the good window display will attract the attention of the thousands who must pass along this thoroughfare each day, and there is the additional practical advantage of an entrance to the trade counter in Upper Thames Street. Our illustration gives but an imperfect idea of the depth of the main showroom, owing to difficulties in photographing, but it indicates generally the large variety of fine fittings displayed there.

A practical feature is the method employed for hanging the fittings, and for switching them on and off. Long white enamelled tubes hang down from the ceiling and terminate in hooks, from which the fittings are suspended, and above each is a tumbler switch with a very long "dolly," or handle. To switch on any fitting, therefore, it is not necessary (as it is in many showrooms) to go to the wall and find, with some

which should be better known than it is, as it should save much wiring in the case of small houses in which economy of wiring is a consideration. In the showrooms there is also a good display of heating and cooking apparatus, electric irons, &c.

A room is set aside for demonstrating different systems of lighting and the effect of different sorts of fittings and lamps—direct, semi-indirect, indirect, Linolite and cornice lighting, colour-matching lamps, &c. Above the showrooms are roomy and convenient offices.

### A TRAIN LIGHTING EQUIPMENT

AN interesting feature of the large exhibit which is being made by Vickers, Ltd., at the Anglo-American Exhibition at Shepherd's Bush, and contains some fine ship models, guns, and examples of miscellaneous tools and metalwork, is the fact that the stand is lighted by a Vickers train-lighting equipment. The apparatus consists of a dynamo, a dynamo regulator, a lamp regulator, and a battery, together with the necessary wiring and lamps. The system is a single battery



difficulty, the switch that controls the particular fitting; the switch is simply pulled on by means of a long rod with a hook at its end. This arrangement allows every fitting to be lighted without the slightest difficulty or complication, and should save much time both to the seller and purchaser.

Justice cannot be done to the artistic designs of the fittings by a mere description; we were particularly struck with the refined taste shown in the design of the comparatively inexpensive, as well as in the more costly examples, with the remarkable result that, in spite of the multiplicity of styles and "periods," the combined effect of the mass of diverse specimens was not jarring, as it might reasonably be expected. Among the smaller fittings we noticed many neat and elegant single-light pendants and table standards, and the number of beautiful shades for the latter showed that every detail had received its due attention. Of the smaller fittings we noted a pleasing design of convertible table and bracket standard, which is the Admiralty registered design for ship-work, but should also be quite effective for dining-room and drawing-room use ashore.

In addition to actual fittings, the best and newest patterns of accessories are also exhibited, including the Ediswan interlocking fool-proof switch plugs for domestic use, and a practical ceiling rose combined with pull-on and pull-off switch,

one, and operates briefly as follows: The dynamo is of the shunt type, and contains no automatic switches or governors. It is carried below the coach and driven by a belt in the usual way. The brushes are mounted on a moving arm, which is automatically rocked over by the friction of the commutator when the direction of rotation changes, consequent on the direction of motion of the train changing. The dynamo regulator, or the regulator controller, as the makers call it, consists of a field regulator operated by a solenoid which has two coils. The main coil is connected in series with the dynamo, and operates the regulator, and consequently the shunt resistance, in terms of the dynamo output. The auxiliary coil is out of circuit until the battery has become fully charged, when it is cut in by an automatic switch. This auxiliary coil exerts a preponderating pull on the solenoid, as compared with the main coil, and when it is in circuit it inserts such an amount of resistance in the dynamo field that the dynamo output is reduced to a few amperes, and the battery is consequently prevented from being overcharged. The regulator controller also contains a dynamo cut-in and cut-out switch, which closes or opens the circuit to the battery and lamps at a pre-determined voltage. It is operated by a compound-wound electro-magnet, one of the coils of which is connected across the dynamo terminals, and



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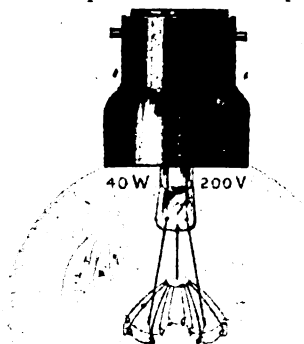
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The Kilowatt Publishing Co., Ltd.,  
203, Temple Chambers, London, E.C.

**F. WIGGINS & SONS,**  
FOR **MICA** INSULATION  
102, 103 & 104, MINORIES, LONDON.

the other of which is in series with the dynamo. A further feature of the regulator controller consists of an adjustable shunt of low resistance, so arranged that any part of it may be connected in parallel with the main coil of the regulator. The dynamo output may be set to any desired value by passing a greater or less part of it through this shunt. The lamp current is taken from the shunt, and it is possible so to regulate it that any proportion of this current shall pass through the regulator shunt coil. These arrangements allow regulation to be made at will on either total dynamo output or battery charging current, or a combination of both. The dynamo output varies directly with the load, while current is supplied to the battery at its normal charging rate until it is fully charged. There is also a lamp voltage regulator which cuts resistance in or out of the lamp circuit, and so maintains the lamp voltage, approximately constant. As an additional feature of their train-lighting equipment, Vickers, Ltd., have developed a type of electric car heater which can be used in connection with it. Two such heaters are exhibited, one of 1,500 watts, and the other of 500 watts, both suitable for a 24-volt circuit.

### MAZDA MERIDIAN LAMPS

THESE lamps have been specially designed to give a larger proportion of their light downwards than standard Mazda lamps with vertical filaments, without the use of ordinary reflectors. The filament of the Meridian lamp is of drawn tungsten wire, wound in a very close spiral. It is formed in the shape of a star, and is mounted in the horizontal plane (with the lamp hanging vertically), so that nearly all the light is thrown directly downwards. This spiral formation adds considerably to the strength of the drawn-wire filament, and also permits a compact arrangement of the light source, even in the fairly high candle-power lamps, which would not otherwise be possible. The lamp can, if desired, be supplied



**MAZDA**  
B.T.H. PATENT.

MAZDA "MERIDIAN" LAMP FOR  
DOWNWARD ILLUMINATION.



FIG 2.—PLAN OF  
FILAMENT.

with a close-fitting opal reflector attached by a screw fixing ring. These reflectors take up very little more room than the bare lamp, and from that point of view may be considered as a part of the lamp. The Mazda Meridian lamp is regularly made in three sizes, 30, 40, and 60 watts for 100-130 and

200-260 volts. It can also be supplied in 20 and 100 watt sizes for 100-130 volts. These lamps are suitable for use in all conditions where an intense illumination is required over a small area, as in the lighting of desks, machine tools, shop windows, billiard tables, &c., &c. Readers who are interested in this new lamp should apply for further particulars to the British Thomson-Houston Co., Ltd., Mazda House, 77 Upper Thames Street, London, E.C.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Cleckheaton.**—Sanction is to be asked for a loan of £8,085 for extensions to the electricity works.

**Grimsby.**—Mr. W. A. Vignoles, the Borough Electrical Engineer, has presented a scheme for extending the plant at the electricity works at an estimated expenditure of £30,000, including prospective expenditure on mains and services. A special Sub-Committee has been appointed to report upon the matter.

**London: L.C.C.**—High- and low-tension cables and stone-ware ducts for the tramway system. Clerk. September 8th. (See advertisement on another page.)

Supply of electric clocks on a rental basis in London is required by H.M. Office of Works. Tenders by August 12th.

**Newport (Mon.)**—The Electricity and Tramways Committee recommends an expenditure of £16,000 on new cables, &c.

**South Africa.**—The Mossel Bay (Cape Province) Municipality proposes to borrow £11,500 for an electric lighting scheme.

**Sunderland.**—Two 1,500-kw. rotary-converters or motor-generators. General Manager. August 19th.

**Walsall.**—Mains are to be extended to Rushall at a cost of £1,147.

**Wednesbury.**—The Electric Lighting Committee recommends the installation of a 300-kw. rotary-converter and transformer with the necessary switchgear at an estimated cost of £1,086.

#### Wiring

**Brentford.**—The Board of Guardians have decided to wire at an expenditure of £40 two blocks at the infirmary.

**Govan.**—Electric lighting at Hawkhead Asylum. August 8th. Clerk. Govan District Board of Control, 7-8 Carlton Place.

**Edinburgh.**—Electric lighting installation at City Museum. City Electrical Engineer. August 17th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Clacton-on-Sea.**—Elementary school.

**Croydon.**—Ten houses, Kilmartin Avenue, and eight houses. Annandale Road. P. Richardson, 30 Addiscombe Avenue.—Three shops, 316-320 Whitehorse Road. W. B. Coomber. 65 Pemdevon Road.

**Erith.**—Elementary school at Belvedere.

**Finchley.**—Elementary school, Summers Lane.

**Huddersfield.**—Cinematograph theatre. Architects, J. Berry & Sons, 3 Market Place.

**Manchester.**—Cinematograph theatre, Patricroft. Architects, Thornley Bros., Wigan.—Extensions, Withington Hospital. South Manchester Guardians.

**Rochdale.**—Alterations at Town Hall. Architect, P. W. Hathaway, Town Hall.

**Sheffield.**—New Shaftesbury Hotel, West Street. Architect, H. Webster, St. Marie's Chambers, Norfolk Row.

**Swansea.**—Block of offices in Adelaide Street. Mr. R. Borlase Matthews is responsible for the electrical equipment.

**Willesden.**—New police court.

**Worthing.**—Cinematograph theatre, Chappel Street.

**Wrexham.**—New town hall.

#### Miscellaneous

**Australia.**—The Melbourne Corporation requires 1,234 meters. Particulars from McIlwraith, McEacharn & Co., Bilter Square Buildings, E.C. Tenders by August 18th.

**Bradford.**—An expenditure of £21,800 upon extending the tramways to Baildon has been sanctioned.

**Brighton.**—Mr. J. Christie, the Borough Electrical Engineer, recommends the adoption of more modern lighting appliances on the sea front, which he anticipates will give better illumination without increased cost.

**Southport.**—Electric organ-blowing equipment, Christ Church. Archdeacon Madden.

**Swinton & Pendlebury.**—Cables, fittings, &c., for public lighting of three and a half miles of street. Borough Electrical Engineer. August 19th.

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Bolton.**—The following tenders have been accepted: Two 1,000-kw. and two 600-kw. rotary-converters, British Westinghouse Co.; E.H.T. three-phase switchgear, British Thomson-Houston Co.; H.T. single-phase switchgear, Johnson & Phillips.

**Leeds.**—The tender of Siemens Brothers Dynamo Works for a turbo-alternator and condensing plant at £34,160 has been accepted, subject to the sanction of the L.G.B. to the necessary loan.

**Salford.**—The tender of the Brush Electrical Engineering Co. has been accepted for twenty-four double-deck bogie cars with vestibule ends; twelve of these cars will have top covers.

**Stoke-on-Trent.**—The Bastian Meter Co. has received a contract for 3- and 5-ampere meters from the Electricity Department.

**Wallasey.**—The tender of the Brush Electrical Engineering Co. has been accepted for the supply of six double-deck cars with top covers, complete with trucks and electrical equipment.

**Walsall.**—The following tenders have been accepted: Turbines, alternators, and auxiliaries, Belliss & Morcom, £17,448; boiler-house plant (four complete boiler units), Babcock & Wilcox, £20,124.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

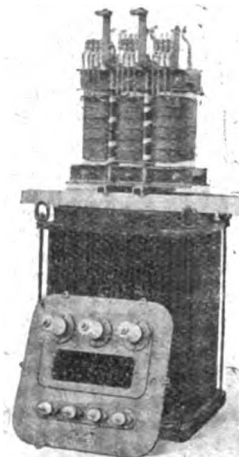
**Price of Copper: Metal Exchange Closed.**—Owing to the closing of the Metal Exchange we are unable to give the usual price of copper this week.

**Reduction in Cable Prices.**—By an unfortunate accident, the error in quoting the price of Henley's 3/22 non-Association Class "W" cable was repeated in our issue of July 23rd. The price is £9 15s. per mile.

**New Zealand Agency.**—An electrical engineer in Wellington (N.Z.) desires to secure the agencies of United Kingdom firms manufacturing dynamos and motors, country-house lighting outfits, switchboards, accumulators, testing instruments, electrical heating apparatus, &c. Further particulars at 73 Basinghall Street, E.C.

**Liquidation.**—A petition for the winding-up of the Leitner Electrical Co., Ltd., will be heard before Mr. Justice Neville in the Chancery Courts on October 13th. Creditors should communicate with Clinton & Co., 59-60 Chancery Lane, W.C.

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**Bankruptcy.**—Trubie Moore, Electrical Engineer, 75 Headingley Mount, Kirkstall Lane, Leeds, has been adjudicated a bankrupt. A first meeting of creditors will be held at the Official Receiver's office, 24 Bond Street, Leeds, on August 7th, at 11.30 a.m., and the public examination will be held at the County Court House, Albion Place, Leeds, on September 8th, at 11 a.m.

**Works Holidays Cancelled.**—The Edison & Swan United Electric Light Co., Ltd., notify us that, owing to important Government business, they have been compelled to abandon the holidays fixed for the present week, and they re-opened on Monday last, August 3rd.

### APPOINTMENTS AND PERSONAL NOTES

At the Whitehall Club on Tuesday, July 28th, Mr. Mark Robinson and Mrs. Robinson were presented with a memento on the occasion of their golden wedding. Some five hundred friends had subscribed to the memento, which was presented in conjunction with an album containing their signatures.

The salary of Mr. W. Marsh, Tramway Manager at Brighton, is to be increased from £400 to £500 per annum.

The Walsall Electricity Committee recommends the appointment of a canvasser in the Electricity Department at a salary of two guineas per week.

A junior draughtsman is required in the Stepney Electricity Department. (See advertisement on another page.)

**Another Fatality at Cardiff.**—We regret to state that a second fatal electrical accident occurred last week in a disconnecting box of the Corporation in Cowbridge Road, when a man named G. H. Rich, who was engaged in fixing a protective covering on a 6,600-volt cable, accidentally cut the insulation of an adjoining 2,400-volt cable and received a shock from which he died.

## LOCAL NOTES

**Brighton: Protest against Relieving Rates.**—At the last meeting of the Corporation, Alderman Gervis, Chairman of the Electricity Committee, protested against the allocation of the profit of £2,342 upon the electricity undertaking last year to the relief of rates. We reported with regard to the Brighton accounts in our issue for July 2nd, page 392, and the Council has already decided to appropriate the balance in the way described. In formally recommending, as Chairman of the Committee, that this decision of the Corporation be carried out, Alderman Gervis said, according to the *Sussex Daily News*, that he was exceedingly sorry the Lighting Committee "had become so infected by the rotten system of finance introduced by the Finance Committee."

**Cardiff: Electricity Accounts.**—The number of units sold last year increased by 656,910 over that of the previous year, whilst the number of consumers increased by no less than 453, making a total of 8,266. The balance in hand now stands at £10,501, and the Borough Electrical Engineer, Mr. Arthur Ellis, recommends that as large a proportion of this as possible shall be carried to depreciation, which in his opinion should equal 10 per cent. of the total capital invested. A recommendation by the Electricity Committee that this amount should be carried to the revenue account of the undertaking was adopted at the last meeting of the Council.

**Edinburgh: Electricity Surplus.**—The Electricity Committee recommends that the surplus on the electricity undertaking for the year, viz., £684, be applied in reduction of capital outlay. This matter is to be discussed later in detail.

**Gloucester: Satisfactory Electricity Progress.**—The past year of the electricity undertaking was one of materially increased progress in all branches. There was also considerable increase in revenue, coupled with a reduction in working expenditure. After meeting all capital charges there was a net profit of £595, compared with a deficit of £106 in the previous twelve months.

**Liverpool: Municipal Engineers as Consultants.**—At the last meeting of the Corporation a protest was raised against Mr. H. Dickinson, the City Electrical Engineer, having received a fee for giving advice to the Salford Electricity Committee. It was pointed out, however, that the Electricity Committee had agreed to the loan of the services of Mr. Dickinson to the Salford Electricity Committee, and that as the latter had chosen to send a fee for these services, it would not be courteous to return it. Furthermore, the standing orders allow for the Liverpool municipal officers to undertake such work with the consent of the Corporation, which consent was obtained in this case.

**London: Lambeth: Price of Electricity.**—Correspondence has taken place between the Council and the South London Electric Supply Corporation with reference to a proposal of the latter to increase the price charged for electrical energy. The Council take exception to this on the ground that the total working costs of the Company are below the average working expenses of the London supply companies, and urges the Company to revert to the original charge for supply. The Directors replied that the increase proposed is unavoidable, and disputed the right of the Borough Council to challenge the right of the Company to fix its own prices. It is understood that further correspondence has ensued, and that the Directors have promised to discuss the question with the representatives of the Council.

**Maidenhead: Electricity Profits.**—The electricity accounts for last year show a net profit of £370, but this is after paying £560 out of revenue for works of a capital nature.

**Southampton: Report on Electricity Undertaking.**—Sir John Snell, President-Elect of the Institution of Electrical Engineers, and Mr. E. Edmonds, a chartered accountant, have presented a joint report upon the general position of the electricity undertaking. There has been a good deal of controversy concerning the commercial policy to be adopted in the management of the electricity undertaking, in which Mr. H. F. Street, the Borough Electrical Engineer, and the Chairman of the Electric Lighting Committee have differed. The report goes into the administration of the Department in considerable detail, and deals with various questions in three sections. It is first stated that the undertaking is perfectly solvent on the basis of its present capitalisation, and the opinion is expressed that the Department can afford to reduce its charge to the Tramway Department. It is regarded as a mistake that the private lighting rates were reduced a short while ago from 3½d. to 3d., and further reductions are regarded as unwise in view of the possible

additional economies in metal-filament lamps. The main point of difference between the Borough Electrical Engineer and the Chairman of the Electric Lighting Committee has been with regard to the charge of ½d. per unit for current for heating purposes. With regard to this the report states that if taken alone, this rate could not be justified, but when its effects on the other departments are considered, then the general improvement in the all-round profits justifies the policy. It is added that in the opinion of the authors of the report, the ½d. per unit policy has not adversely affected the financial soundness of the undertaking. Indeed, the report goes further, and states that if every present lighting consumer took energy for heating and cooking at the ½d. rate to the same extent as the very limited number of consumers who actually purchased in 1912-13, a larger net profit to the undertaking as a whole would result, even at the present high price of coal. At the same time the Council is recommended to consider the adoption of a different type of charge for domestic purposes for either lighting, heating and cooking, or any combination of these three, such, for instance, as a rateable-value system, or upon the basis of a fixed charge per kw. connected, plus ½d. per unit metered. It is only fair, adds the report, to say that the Electrical Engineer has already had in mind a recommendation to this effect. The report also deals with the question of depreciation of meters, cookers, radiators, &c., as well as prepayment installations, and concludes with an expression of opinion that considerable enterprise has been shown in the management and development of the undertaking, and that it will be contrary to the interests of ratepayers and consumers alike were any check to be given to it by a reversal of the main lines of policy. Briefly, the report is a vindication of Mr. Street, who has been the subject of much adverse criticism.

**Southport: Dispute with Contractors.**—The dispute between the Corporation Electricity Department and the local electrical contractors, referred to in our issue of July 2nd, p. 392, was carried a step further last week when another deputation waited upon the Electricity Committee with regard to the matter. The general case, as already stated, was again emphasised to the Committee, but it was decided to defer giving a reply until there had been time for further consideration of the question.

**Warrington: Increased Power Profits.**—The power supply last year showed an increased profit of £3,283, compared with the previous twelve months.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**London Supply Companies' Dividends.**—The following dividends have been declared:—Kensington & Knightsbridge Co., an interim dividend at the rate of 8 per cent. per annum.—City of London Electric Lighting Co., interim dividend of 3 per cent.—Charing Cross, West End & City Co., interim dividend at the rate of 5 per cent. per annum.—County of London Electric Supply Co., interim dividend of 2½ per cent.

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THURSDAY, AUGUST 13, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

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### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

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Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLOQUE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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Letters for Insertion, *Tuesday first post.*

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

AN official communication from H.M. Commissioner of Works states that steps are being taken to continue all Government building and engineering work. (Page 453.)

WE publish some details of Germany's electrical export trade, which should be of interest to manufacturers in this country, as they give quantitative particulars of Germany's commercial activity in various countries in each of the different branches of the electrical manufacturing industry. (Page 455.)

WE give some figures of the number of electrical employees with the Army. (Page 455.)

A QUESTION relating to the design of brush-gear appears in our Questions and Answers columns. (Page 456.)

THE subjects of the Patent Specifications published last week include starting A.-C. motors, heating and cooking apparatus, arc lamp carbons, car-lighting dynamos, and wireless telegraph apparatus. (Page 456.)

A NEW method of eliminating the third harmonic from the wave form of three-phase generators has been proposed by Mr. R. J. Jensen, of Copenhagen. (Page 457.)

THE Institution of Electrical Engineers is preparing a register of men willing to undertake national service of an electrical character. (Page 457.)

THE wiremen's dispute has been settled. (Page 457.)

THE Electrical Trades Benevolent Institution is willing to recommend men now out of work to take the place temporarily of those called out in connection with the war. (Page 457.)

A PLEA for larger air-gaps in induction motors was the substance of a paper recently read before the Association of Mining Electrical Engineers. (Page 458.)

NOTES on the arrangements for the next session at some of the Universities and Technical Colleges are given on page 458.

WE are able to give full particulars of the effect of the war on telegraphic communication throughout the world. (Page 458.)

A NEW power station is contemplated at Blackpool; new cable is required at Bolton, Burnley, Clacton, Gillingham, and Turton; a loan of £21,323 has been sanctioned at Aylesbury; the installation of two suction gas engines driving 33 kw. is recommended at Portrush, and a new 500 kw. turbo-alternator is required at Eastbourne.—A loan of £1,500 has been sanctioned for mains at Hereford. (Page 459.)

A CHARGING station for electric vehicles is to be set up at Eastbourne.—The Glasgow Corporation electricity accounts for last year show a net profit of £819 after setting aside £52,171 for depreciation.—A very successful rearrangement of the electric lighting of the Manchester libraries is being carried out.—The Hove municipal electricity undertaking for its first quarter's work shows extremely successful results. (Page 460.)

THE Yorkshire Electric Power Co. records a net profit for the past year of £10,414, against £6,972 in the corresponding period of last year. (Page 460.)

## GOVERNMENT BUILDING AND ENGINEERING WORK TO CONTINUE

WE have received the following official announcement for publication:—

"It appears from various enquiries addressed to the Commissioners of Works that there exists some apprehension lest unemployment should be increased in the building and other trades by suspension during the present crisis of building and engineering operations provided for in the estimates of the Office of Works recently approved by Parliament. It is, therefore, desirable to state publicly at once that it is the intention of the Commissioners of Works to proceed with all services in their charge, to employ as many men as possible to carry out such services, and to develop and expedite their building programme in any way practicable.

"As the Minister mainly responsible for Government building, the First Commissioner of Works would wish to take this opportunity of expressing his sincere hope that private individuals, companies, firms and contractors will spare no effort to follow the policy of the Government in this matter, so far as circumstances admit."

The Postmaster-General has also expressed his intention to take steps to start work on the new Post Office tube railway.



## GERMANY'S £14,500,000 ELECTRICAL EXPORT TRADE ANALYSED

IT is not generally realised to what an enormous extent Germany's exports of electrical machinery and apparatus have been rising during the last two decades. In 1913 the value of these exports had risen to £14,500,000. During the war these exports will be practically nil. In considering the effect of the war on the electrical industry of this country, account must be taken of the markets which are opened to us immediately owing to Germany's inability to supply. We use the word immediately, and we use it advisedly. Trade to the extent of fourteen and a half millions a year will, it is true, not be transferred to us; but we are able to publish some statistics which show that a large proportion of this export trade of Germany can be ours if we take the proper steps to obtain it, and that some of this can be ours at once.

We have been fortunate enough to get access to a German official return giving particulars of the trade of that country in great detail. To the best of our belief, there is only one copy of this return in England at the present moment, and we may regard ourselves particularly fortunate in being able to publish some of its contents for the benefit of our readers at the present juncture. The return contains a list of Germany's chief customers for its export trade under classified headings, and indicates the proportion which each country has been buying from Germany.

It is seen, for instance, from the figures relating to electrical machinery and apparatus given below that in 1913 British South Africa bought over 1,000 tons of generators, motors, and transformers, about the same weight of cable, 29 tons of metal filament lamps, and 14 tons of electrical measuring instruments and meters from Germany. Belgium has, it will be noticed, been an excellent customer of Germany's for electrical goods; is it unreasonable to expect that she will transfer her custom to us after the war? Argentine and other South American countries are good buyers; they already use a great number of British electrical apparatus, and it is to be hoped that their present electrical requirements will to a large extent be supplied by us. The amount of cable exported by Germany has been enormous in recent years, and they sold nearly two million pounds worth abroad in 1913, including far too big a proportion in this country; it is not unreasonable to hope that a very large proportion of this will be transferred to British manufacturers. The magnitude of the figures relating to electric lamps should give joy to our lamp manufacturers, both small and large. They will have in the first place to tax their works to the utmost to make the lamps required in this country alone, large numbers of which, it is seen, have hitherto been imported from Germany.

We have above only given a few examples, but the full figures for the various electrical products and the countries to which they have been exported are added at the end of this article. The publication of these statistics by us will, we hope, encourage all our electrical manufacturers to lose no time in making an attack on Germany's markets abroad. Although the statistics do not give the values of the exports to each country, but only weights, yet the total weights and total values are given for each item, and it is therefore possible to make a very fair estimate of the value of each particular branch of the trade in every country.

To return to the point mentioned already that a useful proportion of this trade may be diverted to us immediately: we have worked out approximately the proportion of the whole of Germany's exports which have gone to Austria, Russia, and France, and deducted them from the total of £14,500,000. The figure thus obtained is £12,300,000, which represents approximately the trade that might be opened to the other countries which are not at

war. It is obvious that, as these other countries have had their supplies of electrical goods from Germany suddenly cut off, they must immediately begin to buy at any rate a certain proportion of them elsewhere, and we have practically to divide the first spoils with Canada, the United States, Switzerland, and Italy, who, with ourselves, are the chief producers of electrical apparatus and machinery able to continue manufacture. It behoves us, therefore, to lose no time and to see that we get as much business as possible to make up for the business lost, and to keep our manufacturing works going so as to avoid distress among the workmen and staffs.

The business momentarily lost by the war is, of course, difficult to estimate, but, so far as the electrical industry is concerned, we believe that more harm will be done through the disorganisation immediately following the outbreak of war, and the difficulty in the financial position, than by the actual loss of trade. Our electrical exports to Germany, Austria, Russia, France, and Belgium during 1913 were only £511,440, representing but one fourteenth part of our total electrical exports. We lose these now, but we should soon replace them by our share of the £12,300,000 from Germany.

### German Exports in 1913.

The total exports of electrical machinery and apparatus from Germany to all countries in 1913 were of a total value of M.290,482,000, say £14,500,000, and the total weight of these was 133,855 metric tons.

#### Generators, Motors, Transformers, and Choking Coils.

*Machines, &c., up to 25 kg. in Weight.*—Total weight, 741 tons. Value, £144,350. Number of articles, 78,039. Chief countries exported to were:—Belgium, 41 tons; France, 59 tons; Great Britain, 58 tons; Italy, 41 tons; Austro-Hungary, 120 tons; Russia, 182 tons; Switzerland, 41 tons; Spain, 34 tons.

*Machines, &c., from 25 to 100 kg. in Weight.*—Total weight, 3,146 tons. Value, £361,000. Number of articles, 57,356. Chief countries exported to were:—Belgium, 198 tons; France, 236 tons; Great Britain, 268 tons; Italy, 147 tons; Holland, 238 tons; Norway, 60 tons; Austro-Hungary, 532 tons; Russia, 505 tons; Switzerland, 106 tons; Spain, 243 tons; Japan, 63 tons; Argentine, 106 tons; Brazil, 101 tons.

*Machines, &c., from 100 to 500 kg. in Weight.*—Total weight, 7,753 tons. Value, £721,200. Number of articles, 36,528. Chief countries exported to were:—Belgium, 641 tons; Denmark, 147 tons; France, 350 tons; Great Britain, 760 tons; Italy, 347 tons; Holland, 533 tons; Norway, 222 tons; Austro-Hungary, 613 tons; Portugal, 76 tons; Roumania, 116 tons; Russia, 809 tons; Finland, 157 tons; Sweden, 142 tons; Switzerland, 108 tons; Spain, 574 tons; British South Africa, 98 tons; Japan, 128 tons; Argentine, 491 tons; Brazil, 532 tons; Chili, 192 tons; Mexico, 110 tons; Australia, 129 tons.

*Machines, &c., over 500 kg. in Weight.*—Total weight, 25,639 tons. Value, £1,599,850. Number of articles, 11,919. Chief countries exported to were:—Belgium, 2,168 tons; Denmark, 267 tons; France, 1,214 tons; Great Britain, 1,228 tons; Italy, 1,613 tons; Holland, 1,150 tons; Norway, 1,270 tons; Austro-Hungary, 842 tons; Portugal, 229 tons; Roumania, 696 tons; Russia, 2,171 tons; Finland, 238 tons; Sweden, 443 tons; Switzerland, 573 tons; Spain, 2,239 tons; British South Africa, 906 tons; India, 547 tons; China, 266 tons; Japan, 2,419 tons; Dutch Indies, 362 tons; Argentine, 1,387 tons; Brazil, 1,144 tons; Chili, 630 tons; Mexico, 457 tons; Peru, 124 tons; Uruguay, 158 tons.

*Separate Armatures and Commutators.*—Total weight, 4,603 tons. Value, £393,750. The chief countries exported to were:—Belgium, 246 tons; France, 223 tons; Great Britain, 328 tons; Italy, 377 tons; Holland, 294 tons; Austria, 597 tons; Russia, 664 tons; British South Africa, 93 tons; Japan, 328 tons.

*Accumulators and Parts.*—Total weight, 6,452 tons. Value, £286,850. The chief countries exported to were:—Denmark, 823 tons; Holland, 892 tons; Norway, 632 tons; Sweden, 878 tons; Switzerland, 211 tons; Japan, 323 tons; Argentine, 622 tons; Brazil, 228 tons; Chili, 531 tons; Austria, 41 tons.

*Cable.*—Total weight, 47,591 tons. Value, £1,963,400. The chief countries exported to were:—Belgium, 5,305 tons; Denmark, 1,025 tons; Great Britain, 1,073 tons; Italy, 522 tons; Holland, 6,955 tons; Norway, 3,565 tons; Austria, 26 tons; Portugal, 240 tons; Roumania, 567 tons; Russia, 159 tons; Finland, 473 tons; Sweden, 2,281 tons; Switzerland, 67 tons; Spain, 720 tons; Turkey, 175 tons; Egypt, 234 tons; British South Africa, 1,195 tons; China, 507 tons; Japan, 3,724 tons;

Chili, 594 tons; Mexico, 301 tons; Uruguay, 516 tons; Australia, 691 tons. In addition, 4,739 tons of submarine cable was exported.

**Arc Lamps and Mercury Vapour Lamps.**—Total weight, 595 tons. Value, £143,000. Number of articles, 51,838. The chief countries exported to were:—France, 18 tons; Great Britain, 74 tons; Italy, 36 tons; Austria, 40 tons; Russia, 138 tons; Argentina, 105 tons; U.S.A., 25 tons.

**Arc Lamp Carbons.**—Total weight, 7,051 tons. Value, £491,300. The chief countries exported to were:—Belgium, 555 tons; France, 387 tons; Great Britain, 1,740 tons; Italy, 619 tons; Holland, 214 tons; Austria, 428 tons; Russia, 243 tons; Switzerland, 107 tons; Dutch Indies, 69 tons; Argentina, 437 tons; Brazil, 83 tons; Canada, 98 tons; U.S.A., 1,312 tons; Australia, 118 tons.

**Spare Cases and Globes, &c., for Arc and Mercury Vapour Lamps.**—Total weight, 85 tons. Value, £21,600. The chief countries exported to were:—France, 9 tons; Great Britain, 6 tons.

**Projectors and Reflectors.**—Total weight, 283 tons. Value, £97,950. The chief countries exported to were:—Great Britain, 25 tons; Austria, 21 tons; Russia, 60 tons; Japan, 48 tons; U.S.A., 2 tons.

**Metal Filament Lamps.**—Total weight, 2,114 tons. Value, £2,251,900. Aggregate number of lamps, 48,264,231. The chief countries exported to were:—Belgium, 107 tons; Denmark, 61 tons; France, 100 tons; Great Britain, 148 tons; Italy, 155 tons; Holland, 34 tons; Norway, 68 tons; Austria, 233 tons; Portugal, 15 tons; Roumania, 16 tons; Russia, 325 tons; Finland, 35 tons; Sweden, 74 tons; Switzerland, 96 tons; Spain, 104 tons; British South Africa, 29 tons; India, 13 tons; China, 39 tons; Japan, 47 tons; Argentina, 83 tons; Brazil, 77 tons; Canada, 16 tons; Chili, 46 tons; Cuba, 18 tons; Mexico, 30 tons; U.S.A., 14 tons; Australia, 18 tons.

**Carbon Filament and Nernst Lamps.**—Total weight, 242 tons. Value, £167,650. Number of lamps, 7,916,003. The chief countries exported to were:—Belgium, 16 tons; France, 17 tons; Great Britain, 45 tons; Italy, 16 tons; Austria, 16 tons; Russia, 43 tons; Argentina, 16 tons; Brazil, 8 tons; U.S.A., 2 tons.

**Telegraphic Apparatus (excl. Wireless).**—Total weight, 137 tons. Value, £48,200. The chief countries exported to were:—Holland, 9 tons; Russia, 31 tons; China, 8 tons.

**Telephonic Apparatus (excl. Wireless).**—Total weight, 957 tons. Value, £431,800. The chief countries exported to were:—Belgium, 66 tons; Denmark, 32 tons; France, 74 tons; Great Britain, 131 tons; Italy, 123 tons; Holland, 62 tons; Austria, 68 tons; Roumania, 21 tons; Russia, 130 tons; Switzerland, 47 tons; China, 25 tons; Argentina, 27 tons; Brazil, 25 tons.

**Electrical Fuses, Cut-outs, Bells, Signalling Apparatus, &c.**—Total weight, 1,048 tons. Value, £186,700. The chief countries exported to were:—Belgium, 106 tons; Denmark, 61 tons; Great Britain, 186 tons; Italy, 45 tons; Holland, 58 tons; Austria, 40 tons; Russia, 169 tons; Sweden, 49 tons; Switzerland, 42 tons; Argentina, 76 tons; U.S.A., 20 tons.

**Apparatus for Wireless Telegraphy and Telephony.**—Total weight, 277 tons. Value, £82,100. The chief countries exported to were:—Great Britain, 41 tons; Austria, 13 tons; Argentina, 11 tons; U.S.A., 24 tons.

**Electrical Devices for Lighting, Power, &c.**—Total weight, 21,553 tons. Value, £3,702,350. Among the countries exported to were:—Belgium, 1,465 tons; France, 1,121 tons; Great Britain, 1,441 tons; Italy, 1,205 tons; Austria, 1,992 tons; Russia, 2,924 tons; British South Africa, 273 tons; Argentina, 1,520 tons; Australia, 122 tons.

**Electro-Medical and Dental Apparatus.**—Total weight, 610 tons. Value, £228,200. Among the countries exported to were:—Belgium, 29 tons; France, 27 tons; Great Britain, 51 tons; Italy, 22 tons; Austria, 113 tons; Russia, 119 tons.

**Electrical Measuring Instruments, Electricity Meters, and Parts.**—Total weight, 3,321 tons. Value, £1,211,500. The chief countries exported to were:—Belgium, 129 tons; Denmark, 134 tons; France, 184 tons; Great Britain, 275 tons; Italy, 375 tons; Holland, 91 tons; Norway, 43 tons; Austria, 353 tons; Roumania, 26 tons; Russia, 570 tons; Finland, 46 tons; Sweden, 125 tons; Switzerland, 106 tons; Spain, 249 tons; British South Africa, 14 tons; China, 20 tons; Japan, 91 tons; Argentina, 279 tons; Brazil, 34 tons; Chile, 47 tons; U.S.A., 17 tons; Australia, 21 tons.

**Primary Batteries and Parts.**—Total weight, 1,807 tons. Value, £154,150. The chief countries exported to were:—France, 68 tons; Great Britain, 485 tons; Italy, 43 tons; Holland, 146 tons; Russia, 85 tons; Sweden, 252 tons; Switzerland, 135 tons.

**Electrical Heating and Cooking Apparatus and Parts.**—Total weight, 330 tons. Value, £83,750. The chief countries exported to were:—Austria, 42 tons; Russia, 53 tons; Argentina, 30 tons; Brazil, 18 tons.

**Asbestos, Mica, and Micanite Insulators.**—Total weight, 260 tons. Value, £56,300. The chief countries exported to were:—France, 53 tons; Great Britain, 45 tons; Austria, 33 tons.

**Insulating Tubes of Paper, &c.**—Total weight, 4,232 tons. Value, £163,300. The chief countries exported to were:—Belgium, 358 tons; Italy, 364 tons; Austria, 406 tons; Russia, 329 tons; Sweden, 367 tons; Switzerland, 1,253 tons; Argentina, 203 tons; Chili, 205 tons.

## ELECTRICAL EMPLOYEES WITH THE ARMY

VERY large numbers of the employees of electric supply, tramway, and manufacturing undertakings of Great Britain are now serving in the Army and Navy and Territorials. We give a few examples below. In many cases arrangements are being made to continue the full pay of the men in the case of married employees and half-pay to single employees, in other instances the difference between the Army pay and the ordinary wages is being paid, and in others the firm guarantees to look after the wives and families of the men. It will be seen that the tramway undertakings are supplying the largest numbers of men, probably for the reason that so many Army reservists find employment in this direction.

**London County Council Tramways.**—700 men, and an additional 400 men are liable to be called upon as National Reservists.

**Glasgow Corporation Tramways.**—604 men, including many members of the engineering staff.

**Birmingham Corporation Tramways.**—340 men.

**Manchester Corporation Tramways.**—346 men.

**Metropolitan Electric Tramways.**—233 men.

**London United Tramways.**—150 men.

**Liverpool Corporation Tramways.**—400 men. The deputy chairman of the Tramways Committee, Major R. J. Clark, is serving with the 9th Batt. the King's Liverpool Regiment.

**British Thomson-Houston Co.**—130 men from staff and works, including Commander H. G. Glennie, R.N., J. N. Macdonald (King's Horse), R. Waterhouse (6th Lancashire Fusiliers). It is anticipated that the number will eventually amount to 200.

**Birmingham Corporation Electricity Department.**—80 men, including the assistant mains engineer, Capt. R. B. Bowler, Royal Engineers (Territorials).

**Crompton & Co.**—150 men.

**Dundee Corporation Electricity Department.**—36 men, including Mr. G. Marshall, assistant mains superintendent, and several junior attendants in the generating and sub-stations.

**W. T. Henley's Telegraph Works Co.**—120 men, including the chief electrician at the Gravesend works, Mr. Leeseaux, and Mr. R. A. Hatton, engineer at Woolwich.

**North Metropolitan Electric Power Supply Co.**—33 men.

**South Metropolitan Electric Tramways and Lighting Co.**—25 men.

**Manchester Corporation Electricity Department.**—59 men.

**Glasgow Corporation Electricity Department.**—58 men.

**Automatic Telephone Manufacturing Co.**—50 men.

**Cardiff Lighting & Tramways Department.**—75 men.

**Belfast Corporation Electricity Department.**—25 men.

**General Electric Co.**—Many men from all departments, including the head of the Publicity Department, Lieut. H. Clifford Palmer, of the London Scottish.

**Siemens Bros. & Co.**—All departments have sent men.

**Edinburgh Corporation Electricity Department.**—30 men.

**The Volunteer Civil Force.**—We are requested to announce that members of the Volunteer Civil Force are prepared to offer their services in any part of the country for the protection of engineering works and electrical power stations, &c. In view of the possibility of rioting some satisfactory means of protection of private property should be found at once, and this they are prepared to do by sending trained men who have had experience in a similar direction. Full particulars will be forwarded on application to Ruskin House, Rochester Row, Westminster, S.W.

**The International Kinematograph Exhibition.**—It has been decided to postpone this Exhibition definitely until the first week in January—provisionally some time between December 26th, 1914, and January 6th, 1915—on the understanding that firms who have booked space for the present Exhibition shall renew their contracts for the succeeding one. This postponement has been made entirely in the interests of the trade, and the Exhibition authorities ask the trade for their help in the next Exhibition, in order to recoup them for the sacrifices made in postponing the present one.

**Future of London's Electricity Supply.**—The London County Council has suggested to the corporations and councils concerned in the proposed electricity scheme, of which we gave details in our issue for July 30th, that a conference should be held in October to go into details prior to the Council's application for Parliamentary powers.

**Electric Vehicle Charging Tariffs.**—Fifty-four municipalities and three electric supply companies have adopted a flat rate of 1d. per unit for charging electric vehicles.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no

award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,402.

Owing to the war conditions it is not surprising that no replies have been received.

### QUESTION No. 1,403.

What are the main requirements to be kept in view in the design of brush holders for large multipolar machines?

(Replies must be received not later than first post, August 20th.)

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published August 6th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

15,875/13. **Starting Alternating-Current Motors.** *Ateliers de Constructions Electriques de Charleroi.* This specification describes an arrangement for starting cascade groups composed of an asynchronous machine with its rotor connected directly to the armature of a synchronous machine. A polyphase reactance is used, as well as a resistance to facilitate getting into synchronism. Five figures.

17,453/13. **Electric Heating and Cooking Apparatus.** *C. Clarke.* In this apparatus the utensil is constructed with a bottom of a special form to resist distortion by heat, and has a true flat or lenticular surface to make good contact with a surface of corresponding shape on the separate hot-plate. Seven figures.

22,222/13. **Arc Lamp Carbons.** *F. M. Lewis.* Arc light electrodes with a mixture of chemicals on the outer surface, including chromates as well as the usual mixture of tungstates and fluorides.

23,277/13. **A Magnetic Motor.** *E. W. Fuller.* This curious motor is to convert the pull of permanent magnets into rotation, and appears to amount to an attempt at perpetual motion. One figure.

27,354/13. **Car Lighting Dynamos.** *F. L. Hollister.* In these machines, the regulation is effected by a variable negative coefficient resistance in conjunction with a demagnetising coil for the variation of the field. Three figures.

5,281/14. **Production of Electric Waves.** *H. D. Dwyer.* An oscillator for the production of electric waves, comprising two thin hollow stationary electrodes with opposite parallel surfaces immersed in a vessel of imperfectly conducting liquid. One electrode has a small aperture through which the liquid, continuously drawn off and cooled, is projected against the other electrode. One figure.

6,418/14. **Condensers.** *A. E. G.* These condensers comprise layers continuously wound to form a spiral body. The conducting plates consist of strips with rounded edges, and of a thickness determined by the working voltage. One figure.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** *Fisher* [Jointing cables] 20,140/13; *Burton, Burton and Burton* [Metallic conduits] 4,583/14.

**Dynamos, Motors, and Transformers:** *Tattersall & Tattersall* [Starting and lighting motor-cars] 22,503/13.

**Heating and Cooking:** *Trenerz and Kingman* [Water heating] 19,803/13; *Paget* [Heating elements] 23,715/13; *Foster* [Heating elements] 24,565/13.

**Ignition:** *Varley* [Ignition, lighting, and starting system] 7,482/14; *R. Bosch* [Battery leads] 7,686/14.

**Incandescent Lamps:** *Kruger and Sannig* [Incandescent lamps] 27,771/13; *Voss, Mathe, and Burger* [Filaments] 6,037/13.

**Switchgear, Fuses, and Fittings:** *Fletcher* [Illumination of chart tables] 19,205; *Siemens Brothers Dynamo Works, Ltd. (Siemens Schuckertwerke)* [Switches] 28,633/13; *Heck* [Mounting bracket for switches] 3,900/13.

**Telephony and Telegraphy:** *Automatic Telephone Manufacturing Co. and Harrison* (partly *Automatic Electric Co., U.S.A.*) [Party line telephone system] 13,976/13; *Western Electric Co. (Woodward)* [Telephone machine switching] 16,696/13 and 24,928/13; and [Telephone repeaters] 25,659/13; *Siemens & Halske A.G.* [Automatic and semi-automatic telephone systems] 12,483/14.

**Traction:** *Meakin* [Signals] 19,205/13; *Gill and Davidass* [Train stop] 22,655/13; *Bottle* [Automatic signalling] 25,129/13; *Boirault* [Electric couplings] 196/13.

**Miscellaneous:** *Hirst and Jenkinson* [Signs] 17,265/13; *Entwistle & Kenyon, Ltd., Kenyon and Shorrocks* [Vacuum cleaners] 17,475/13; *Cambridge Scientific Instrument Co. and Arthorpe* [Galvanometers] 20,654/13; *Newton* [Magnetising permanent magnets] 24,327/13; *Siemens & Halske A.G.* [Electric riveting] 27,050/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos and Motors:** *Kettering* [Engine starters] 13,022/14; *Renault* [Engine starters] 15,464/14.

**Electrometallurgy:** *Geb. Siemens* [Manufacture of compounds of rare earth metals] 9,534/14; *Ozil* [Electro-deposition] 16,776/14.

**Ignition:** *Mueller* [Magnets] 4,562/14.

**Instruments:** *Szilard* [Electrometers] 16,945/14.

**Switchgear, Fittings, &c.:** *Chalier* [Theatre lighting fittings] 16,203/14; *Siemens Schuckertwerke* [Protective gear] 16,860/14.

The following Amended Specification may now be obtained:—

*J. G. Statter* [Time limit devices], 25,606/12; *B. T. H. Co. (G.E.C., U.S.A.)* [Annealing magnetic matter] 25,902/12; *F. Sahler* [Secondary battery plates] 8,469/13; *N. A. Halbertsma* [Arc lamps] 8,597/13.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors, and Transformers:** *F. N. Maude* [Generator] 9,571/09.

**Ignition:** *A. Just, F. Hanaman, H. Landesberger, J. Salzmann, and the Vereinigte Electricitäts A.G.* [Mounting filaments] 9,349/06.

**Instruments and Meters, &c.:** *V. A. Arcioni* [Meters] 8,518/01.

**Switchgear, Fuses, and Fittings:** *Lillicrop* [Motor starters] 8,752/08; *R. van R. Sill* [Controllers] 9,349/09; *Weckmar* [Cut outs] 9,803/09.

**Traction:** *M. Cummings* [Electric sanding gear] 9,270/07; *Daimler Motor Co. and F. W. Lanchester* [Petrol-electric vehicles] 9,259/09.

**Miscellaneous:** *C. Hollinghurst* [Signs] 9,250/09.

## ELIMINATION OF THE THIRD HARMONIC FROM THE WAVE FORM OF THREE-PHASE GENERATORS

THE troublesome effects of a third harmonic in the wave form of a three-phase generator when the neutral is earthed are too well known amongst electrical engineers, particularly the disturbing induction effects on telephone systems in the case of long-distance transmissions, and the circulating currents in the case of parallel running of two machines with earthed neutrals. Various methods of eliminating the third harmonic have been suggested, such as the special shaping of the pole shoes, and the irregular spacing of the slots; but the effective methods are too costly for practical application. To obviate telephone disturbances in the case of cable transmission an insulated metal sheath, such as the lead covering within an armoured cable, may be connected to the neutral; but for overhead work the trouble is more difficult to overcome. In the case of parallel running, arrangements may be made to earth only one

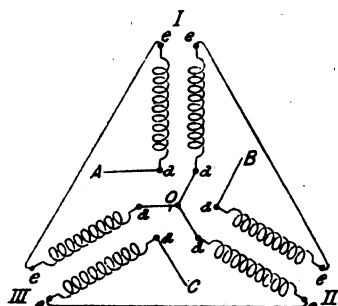


DIAGRAM OF CONNECTIONS.

machine, but these are generally unreliable. On the other hand, choking coils or resistances may be inserted in the earth connections to reduce the value of the circulating currents.

The most satisfactory solution of the problem, however, would be to eliminate the third harmonic altogether, and in the *Elektrotechnische Zeitschrift* of June 4th, Mr. R. J. Jensen, of Copenhagen, describes a comparatively simple method for new machines, which will doubtless be adopted to some extent in the future. It consists in dividing each phase of the three-phase winding of the generator into two equal parts, and then connecting the six windings in zig-zag, exactly as is done in the case of three-phase transformers for the purpose of balancing an unsymmetrical load. The connections are made according to the accompanying diagram, in which I., II., and III. represent the three (phase) windings of the generator. Each is divided into two portions, 1 and 2, and it is necessary, therefore, that the machine should be designed with an even number of slots per pole per phase. A third harmonic is generated in each of the six windings in the direction  $a$  to  $e$ , and the two harmonics cancel out, therefore, in each phase. The resultant E.M.F. of the fundamental wave is smaller than the E.M.F. of the original machine in the ratio of  $\sqrt{3}$  to 2, and so for the same output this machine will require 6 per cent. more copper. The armature reaction remains the same, but the ohmic loss and the inductive drop will each be 6 per cent. greater. The iron losses will be 15 per cent. greater. In addition, the author remarks that three-phase transformers wound zig-zag for purposes of balancing are in the same way impenetrable to third harmonics, and the neutral can therefore be earthed without fear of disturbances to telephone circuits.

## NATIONAL SERVICE

THE Council of the Institution of Electrical Engineers is sending out a circular suggesting that there are two important directions in which the members and also electrical men who are not members may be of service to the nation at the present time: By placing their services as electrical engineers at the disposal of the War Office and of the Admiralty, and by holding themselves in readiness to fill vacancies in public services, electric power stations, tramways, railways, &c., caused by the calling up of the Reserves and Territorial Forces. The Council have decided to prepare classified lists of suitable men for this purpose, and in this connection are issuing forms to be filled in with particulars of the kind of work for which applicants are fitted. It is

assumed that the rates of pay would be the current rates for the services rendered. The Council desire not only to receive offers of services from members of the Institution, but also that all members should assist them to obtain the names of as many qualified men as possible (whether or not members of the Institution) willing to offer their services. The Council have offered to place at the disposal of the War Office, for immediate occupation and free of charge, the available portions of the Institution building, of a total area of 10,000 sq. ft.

Those applying are requested to supply the following particulars:—Name, class of membership, address, nationality, age, number of days' notice required before duties can be taken up, whether single or married, present occupation, place of occupation, present employer, address of present employer; military, naval, or marine experience and status (if any); foreign languages; and whether services are offered for army (abroad or at home), navy (shore duties), or to fill vacancies in connection with public services, electric power stations, tramways, railways, &c., in own locality or elsewhere in the United Kingdom.

The applicant is further asked whether he is prepared to undertake supervising work or actual manual work, and to state for what trade he is qualified. The various occupations are scheduled as follows:—Erection, running, repairing, or testing of: boilers and boiler-room plant; steam engines; turbines; gas and oil engines; dynamos, motors, transformers; heavy electrical plant, cranes, winches, &c.; electric light and power installations; switchboards; traction, track, and overhead work; locos. and rolling stock; cables; mains and services; overhead power lines; telegraph and telephone lines; telegraph apparatus; wireless apparatus; telephone apparatus; light electrical plant or apparatus; searchlights; military and naval signalling; electric blasting apparatus; Röntgen apparatus; inspection of electrical machinery and apparatus and passing same for purchase; coding and decoding of telegrams.

## END OF THE WIREMEN'S STRIKE

WE have received the following letter from Mr. L. G. Tate, hon. secretary of the London Electrical Masters' Association:—

"I have pleasure in notifying you that the strike of electrical wiremen in London initiated by the Electrical Trades Union on April 1st is now at an end, the members of the Union having been instructed to return to work. The working rules issued by the London Electrical Masters Association in March, 1914, have been adopted for a further six months, and a joint committee of masters and men will be appointed to adjudicate on any questions of hardship that may be brought forward. I may add that these proposals were put forward by the masters in the early part of April, but were then refused by the Union."

## CORRESPONDENCE

### THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.

To the Editor of ELECTRICAL ENGINEERING.

DEAR SIR,—At the present moment there must be a considerable number of firms whose staffs have been somewhat depleted by the calls on the Territorials and also the departure of foreigners to their countries. As this Institution is now assisting four or five gentlemen who would be capable of occupying such positions for the time being, I shall be glad if through your columns you could induce firms requiring any of these to communicate with me. This will have a double advantage, first, providing work for persons who are wanting it, and secondly, enabling this Institution to husband its resources, a step which is more necessary than ever at the present time. I may add that I regret to hear from one of those we have assisted in the shape of helping the man and his wife to set up lodgings, that owing to the war a German lodger who was sent to them by an electrical firm has had to go, and they are thus again placed in pecuniary difficulties. Their house is close to one of the South London Tube stations.

18, Park Mansions,  
Vauxhall Park, S.W.,  
Aug. 6th, 1914.

Yours faithfully,  
F. B. O. HAWES,

Secretary,  
The Electrical Trades Benevolent  
Institution.

**The B.E.A.M.A. and Admiralty and War Office Orders.**—Immediately after the outbreak of hostilities, the Council of the B.E.A.M.A., on behalf of the members, wrote to the Admiralty and War Office offering to use every endeavour towards expediting Government contracts. The Council have no doubt that their action will meet with the hearty support and approval of every member of the Association.



## AIR GAPS OF ELECTRIC MOTORS

THE above is the title of a Paper recently read before the Association of Mining Electrical Engineers (North of England branch) by Mr. C. Lewis. The substance of the Paper is a plea for larger air-gaps than are usually found in recent induction-motor practice. The reason for the meagre air-gaps which are at present used is that a large air-gap means a larger, and therefore more expensive, motor for the same output. Mr. Lewis recommends that the makers of induction motors should be asked to stipulate the length of air-gap they employ in their machines, so as to enable the prospective purchaser to form a correct estimate of the relative capabilities of the latter. With a very small air-gap, a slight amount of eccentricity of the armature between the poles will cause a serious inequality of flux distribution, and consequently local armature currents will be set up. In the case of D.C. machines, however, a definite length of gap is necessary to provide reluctance in the path of the cross flux of the armature, so that the space has not been reduced to the fine limits which are found in induction motors. The use of a larger gap entails a reduced efficiency and a higher first cost. The advantage gained by its adoption is greater immunity from breakdown, and whether large or small air-gaps are desirable will depend upon the capital cost of the plant and subsequent maintenance charges, and the importance of reliability.

Dealing with the case of a consumer using town supply, the author showed that as a large gap only increases the magnetising current which is the wattless component of the load, its adoption would be a distinct advantage to the consumer. In the case of a colliery company generating their own power, this wattless current has to be considered, owing to its undesirable effect upon the power-factor. There will be a certain length of gap beyond which it will not be desirable to go. In conclusion, however, the author ventures to prophesy that the adoption of a reasonable air-gap would ensure such a continuity of service and saving in depreciation costs as would largely compensate for the increased initial cost, as well as raising the prestige of the induction motor generally.

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

WE have received a copy of the prospectus of the University courses at the Municipal School of Technology, Manchester, the Electrical Engineering Department of which is under Prof. Miles Walker. The training is of a particularly broad and practical kind, and several members of the staffs of manufacturing firms take part in the teaching. Among the subjects of lectures may be mentioned works management, costing, the calculation of electric winding engines, switchgear, &c.

The prospectus of the Faculty of Engineering of University College, London, gives particulars of the courses for the forthcoming session. The Electrical Engineering Department is under Prof. J. A. Fleming, F.R.S., assisted by Prof. W. C. Clinton and Mr. P. R. Coursey. Mr. E. Kilburn Scott also gives lectures on electrical design. The ordinary course qualifies for the London B.Sc. degree, and there are special opportunities for post-graduate and research work.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Since our last issue, notices concerning the state of telegraphic and radio-telegraphic communications have been numerous, and are likely to become still more so as other States and countries become involved in the great European struggle.—On the 4th inst. private telegrams to Switzerland and in transit *via* that country had to be written in plain German, French, or Italian, while those without text or signature are not admitted. There is also delay owing to Government censorship.—The Belgian Administration stated on the 5th inst. that telegrams in code or cipher were totally suspended to and from Belgium.—Turkey on the same day refused to admit telegrams in code.—The Government of the Union of South Africa, under Article 8 of the International Telegraphic Convention and Article 17 of the Radio-telegraphic Convention, until further notice only admits telegrams and radio-telegrams to, from, or in transit over their lines written in plain English, French, or Dutch. They must be signed by the sender. Abbreviated addresses are not permitted. Messages in plain language are accepted at sender's risk, but British Government telegrams are not submitted to any restrictions.—France also only accepts private tele-

grams for France and Algeria at sender's risk, and only when written in plain German, English, Spanish, French, Italian, Portuguese, or Russian. They must be so worded as to offer an intelligible meaning to the telegraph service. They are subject to delay and to censorship.—Telegraphic and telephonic communication is also suspended between Belgium and Germany.—On the 6th inst. the British Government confirmed that all telegrams must be written in English or French, and that they are accepted at sender's risk, subject to censorship. They may be stopped, kept back, or treated as of no consequence whatever, and no advices will be issued to the sender. Applications for refunds will not be considered, whatever their nature may be. It is very important that all telegrams bear the signature of the sender at the end of the telegram, as otherwise they are held till the name is supplied by paid service advice.—On this day, also, the Western Telegraph Co. suspended the deferred and week-end letter service.—Censorship was established at Madagascar, telegrams in code or cipher not being admitted.—By reason of lines being much encumbered between Rome and Zante, telegrams in transit for Italy and routed *via* Zante are subject to great delay, and are only accepted at sender's risk.—Communication also between Berlin and St. Petersburg, Teheran and Tokio is interrupted.—The Commercial Cable Co. states that they are only able to accept on their lines telegrams fulfilling the conditions imposed by the British Government.—The French Government, according to Articles 8 and 17 of the Telegraphic and Radio-telegraphic Conventions, only accepts messages for Algeria and French Colonies and Protectorates in plain French or English, and bearing the sender's signature. They are accepted at sender's risk, and applications for refunds cannot be entertained. Secret language can only be used for Government telegrams of France, Great Britain, Russia, and Belgium.—The Commonwealth of Australia, according to the above-mentioned Articles, has decided to suspend all telegrams to, from, and in transit over its lines, excepting British or Australian Government messages. As an act of grace, however, until further advice telegrams in plain English or French are accepted at sender's risk, and subject to censorship, and they must bear the signature of the sender, but abbreviated addresses are not permitted.—The Ottoman Administration on the 7th inst. stated that all telegrams arriving contrary to notices are held up without advice to senders.—The Compagnie Française des Câbles Télégraphiques has suspended the deferred service.—The French Government state that lines between Belgium and Luxembourg are interrupted, and that secret language is admitted on French lines for Italian and Spanish Government messages. Telegrams for Turkey can only be written in Turkish or French. Secret language is only permitted for diplomatic and consular telegrams.—The Great Northern Telegraph Co. has also suspended the deferred service.—On the 8th inst. the Netherland Indies Government stated that Government telegrams in plain or secret language are admitted for all non-belligerent countries.—All communication with Germany, Austria, and Hungary is cut off, and the Eastern suspended the deferred and week-end service on the 5th inst., and the South American Cable Co. on the 9th.—Communication between Hungary and Montenegro is down.—The Servian Government state all telegrams are accepted at sender's risk, and must only be in plain language. This also refers to telegrams in transit.—The Austrian Administration states that telegrams for France, Great Britain, Belgium, and places beyond these countries, as well as their possessions and Protectorates, cannot be routed *via* Austria.—The Ottoman Office on the 10th inst. confirmed that plain Turkish, Arabic, and French are only admitted for private telegrams, which must have full address and signature. Telegrams without text are not admitted, and no advices are sent to senders of telegrams contrary to regulations being stopped.—The administration of Indo-China states on the 11th inst. that telegrams to, from, and in transit for Indo-China must be sent in plain intelligible French or English, the name of the sender appearing after the text. Abbreviated addresses are not now permitted, and the deferred service is suspended. Telegrams for Germany and Austria are prohibited.—The Great Northern Telegraph Co. confirms the suspension of deferred telegrams on their lines.

The *Morning Post* points out that the capture of Togoland by the British Forces deprives the Germans of the use of the large Telefunken wireless station there. Regular communication has been maintained between this station and Nauen since May.

The Committee for Radiotelegraphic Investigation of the British Association announces that the proposed observations during the total eclipse of the sun on August 21st have been abandoned owing to the war.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### OSRAM HALF-WATT LAMPS FOR LIGHTHOUSES

THE use of Osram half-watt lamps in lighthouses has proved most satisfactory, as the light emitted by these lamps is very penetrating, and, since the filament is concentrated in a small space, focussing is particularly easy. The illustration shows a 8,000-c.p. Osram half-watt lamp in a lighthouse on the end of the Port Talbot Dock and Railway Co.'s pier. This is badly exposed to the weather, but the lamp has not



LIGHTHOUSE AT PORT TALBOT EQUIPPED WITH 3,000-C.P. HALF-WATT LAMP.

suffered. A 1,000-watt 1,000-c.p. Osram drawn-wire lamp was first installed, and the pilots were able to pick up the light when off the Mumbles Head, a distance of between 4½ and 5 miles. This lamp was superseded by the 1,500-watt 8,000-c.p. Osram half-watt lamp, and the pilots are now able to pick up the light when about seven miles down channel. An Osram half-watt lamp installed on the pier-head at Dunoon has also stood up to the very severe weather conditions without any protection whatever.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**CHAINS.**—An effective wall sheet entitled "The Care of Chains and the Prevention of Accidents" is being issued by Weldless Chains, Ltd. (Gartsberrie, Coatbridge), and will be sent post free to any firm who applies for a copy.

**HEATING AND COOKING APPARATUS.**—An illustrated leaflet from R. H. Haylock & Son (63 Queen Victoria Street, E.C.) describes an electric stove, grill, and immersion heater known respectively as El Glo, Stovo, El Grillo, and El Boilo, and a hot-point electric iron.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**MOTOR STARTERS.**—Leaflets from the Electrical Apparatus Co., Ltd. (Vauxhall Works, South Lambeth Road, S.W.), contain particulars of the latest types of standard types of motor starters manufactured by this firm. The company states that owing to all their material being purchased in England, their deliveries will be very little affected by the war.

**ELECTRIC CARS.**—A handsomely illustrated booklet entitled "The Silent Waverley Electric Year Book" describes some

luxurious electric carriages made by the Waverley Company of Indianapolis.

**MAZDA HOUSE NEWS.**—The July-August issue of this bright little journal gives interesting information of the newest types of Mazda lamps and other novelties of the British Thomson-Houston Co., and a number of views of up-to-date lighting installations.

**INSULATORS.**—A very large number of patterns of insulators are described in a new catalogue from Doulton & Co., Ltd. (Lambeth, S.E.). All these are British made, and deliveries can be given as usual.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Aylesbury.**—Subject to the Board of Trade approving the proposed site of the generating station, the Local Government Board will sanction a loan of £21,323 for the Council's electricity undertaking.

**Blackburn.**—A new power station is contemplated.

**Bolton.**—An expenditure of £600 is contemplated, upon cable, services, &c.

**Burnley.**—New cable at an estimated cost of £540 is required.

**Cheadle and Gatley.**—A report is being prepared as to taking a supply in bulk from Stockport, and alternatively, for Stockport to supply in detail.

**Clacton.**—Cable extensions are recommended.

**Gobham.**—The Ascot District Gas and Electricity Co. is proposing to supply in this district. An offer has also been received from the Woking Electric Supply Co. The Ascot Co., however, has statutory powers in the district.

**Earsdon.**—Poles, cables, lamps, &c., for public lighting. Clerk. August 15th.

**Eastbourne.**—A sum of £4,000 is to be spent on replacing certain plant at the power station.

The new plant will consist of a 500-kw. turbo-alternator for running on light load in lieu of the reciprocating engine set now used for this purpose. The Borough Electrical Engineer reports that the running of such a set would effect a saving of £918 per annum, compared with the present cost of the reciprocating engine. The capital expenditure is to be met partly out of the renewals fund and partly out of the reserve fund.

**Gillingham.**—Sanction to a loan of £7,500 for mains and services is to be applied for.

**Hereford.**—The L.G.B. has sanctioned a loan of £1,500 for mains, repayable in twenty-five years, and £1,080 for miscellaneous works at the power station.

**Mold.**—Communications are passing between the Clerk and the Town Clerk of Flint with regard to the proposed electric lighting scheme.

**Portrush.**—The Council, which possesses an electric lighting provisional Order, is recommended to instal two 55-h.p. suction gas engines driving two 33-kw. dynamos, with battery, booster, and balancers, in the proposed power station. Messrs. J. Woodside & Co., of Belfast, are consulting engineers. The scheme includes public lighting, consisting of sixty-five standards each fitted with two 80-watt metal filament lamps, and thirty-one each fitted with a 60-watt lamp.

**Turton.**—An expenditure of £600 is contemplated upon cables.

#### Wiring

**Dundee.**—Electric lighting of Harris Academy Public School. Clerk, School Board Offices. August 15th.

**Edinburgh.**—Electric lighting of public wash-house, Green-side. City Electrical Engineer. August 17th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Accorington.**—Fire station, Manchester Road.

**Altrincham.**—Council school. Cheshire County Architect.

**Barnsley.**—School. Architect, E. W. Dyson, Regent Street.  
**Blackburn.**—New fire station.  
**Farnworth.**—Secondary school. County Architect, Preston.  
**Manchester.**—Co-operative stores. Ashton Old Road. Architect, J. B. Thornley.—Cinematograph theatre. Rusholme. Architects, Mangall & Littlewood.—New works and offices. Ashton New Road. Architect, W. H. Longworth.  
**Paignton.**—Extensions to isolation hospital (£2,537).

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Manchester.**—Among the tenders recently placed by the Electricity Department are the following:—Cable, British Insulated & Helsby Cables, Ltd.; Electrical Engineering & Equipment Co.; Union Cable Co.; W. T. Glover & Co. Lamp-holders, shades, switches, fuses, B.T.-H. Co. Tumbler switches, General Electric Co. Insulating tape, W. T. Glover & Co.; W. T. Henley's Telegraph Works Co.; and India-Bubber, Gutta Percha and Telegraph Works Co. Compound, Callender's Cable and Construction Co.

**Middleton.**—The tender of E. Green & Son has been accepted for economisers at the power station.

**York.**—The following tenders have been accepted by the lighting and tramways department:—Rotary-converters, transformers, and connecting cables, General Electric Co.; switchgear, B.T.-H. Co.

### LOCAL NOTES

**Eastbourne:** *Charging Electric Vehicles.*—A 50-kw. dynamo at the power station is to be converted into a charging set for electric vehicles. The tariff has been fixed at 1½d. per unit.

**Glasgow:** *Electricity Accounts.*—After meeting capital charges and setting aside £52,171 for depreciation, there was a net profit of £819 upon the Corporation electricity undertaking last year. The average price received per unit was 1'157d., a reduction of 0'13d. per unit compared with the previous twelve months.

**Hove:** *Progress of Electrical Undertaking.*—The Engineer and Manager of the Council's electricity undertaking reports most satisfactory progress for the first quarter's working under municipal control. The total revenue was £4,149 as against £3,771 in the corresponding quarter of last year, whilst the works costs have decreased from £1,135 to £1,095. This result has been achieved, notwithstanding that this quarter is the lightest one of the year. Further economies are looked to when the new generating station is installed, and the question of the reduction of tariff is being considered in view of this.

**Kingstown:** *Electric Lighting.*—The Council has decided to purchase the electric lighting provisional Order granted this session to the Dublin & Southern District Electric Supply Co.

**Manchester:** *Efficient Library Lighting.*—As the result of a re-arrangement of the electric lighting in the Corporation libraries, a reduction of 50 per cent. in the current consumption has been brought about, together with a saving of £1,000 in the annual cost.

### APPOINTMENTS AND PERSONAL NOTES

The Oldham Corporation has appointed Messrs. Ogden and Chamberlain Joint Borough Electrical Engineers in succession to the late Mr. S. W. Newington.

The Maidstone Electricity Committee recommends that the present system of paying the Borough Electrical Engineer a bonus according to the profits of the undertaking be abolished, and that Mr. Hoadley's salary, as from April 1st, 1914, should be £550 per annum.

Mr. Edgar Kent succeeds Mr. F. Barlow as Superintendent of the Meter and Electrical Testing Department at Salford, at a commencing salary of £150 per annum, rising to £200.

Mr. F. Birch has been appointed Superintendent of the Motor-Hire Department.

A shift engineer is required by the Stretford U.D.C. at a commencing salary of £2 per week. Experience in D.C. combined traction, lighting, and power station necessary.

The Hele-Shaw prizes in the Faculty of Engineering of the University of Bristol have been awarded to J. Rogers, day student, and A. G. Adams.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is still closed and there is no official quotation for copper, the price may be taken as between £68 and £70.

**Dissolution of Partnership.**—Messrs. F. J. Allen and E. C. Beman, trading as The Electric Supplies Co. (53 Victoria Street, S.W.), has been dissolved. Mr. Beman will continue the business.

**The Marconi Press Agency.**—The expansion of this side of the Marconi Co.'s work has necessitated extension of its premises on the ground floor of Marconi House, facing Aldwych. The name will be changed to Wireless Press, Ltd., under which style the publication of the *Wireless World* and various books, &c., on wireless telegraphy will be continued.

**Belling & Co.**—Messrs. Belling & Co. inform us that, although they have at the moment nearly a thousand complete electrical fires in stock ready for delivery, and an equal number of sets of parts in different stages of completion, they are still keeping their hands at work assembling more fires for stock.

**Liquidations.**—The British Economical Lamp Co., Ltd., has gone into voluntary liquidation for reconstruction. Mr. H. E. Leigh, Windsor House, Kingsway, W.C., is liquidator.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Yorkshire Electric Power Co.**—The net profit for the six months ended June 30th was £10,414, against £6,972 in the previous half year. Including the balance brought forward the sum available is £14,602, which is reduced to £12,352 after meeting second mortgage bonus. As already announced, 2 per cent. is to be paid on the ordinary shares, in addition to the 6 per cent. preference dividend. The second 3,000-kw. turbine in the Waste Heat Station at Barugh has now been put on load, and mains are being laid in a large number of other stations. Supply has also been given since July 9th in Goole for railway, dock, and general purposes.

**London Supply Companies' Dividends.**—The directors of the Metropolitan Electric Supply Co. announce that although under ordinary circumstances they would have no hesitation in declaring an interim dividend at the same rate as last year, viz., 4 per cent. per annum, they have decided that it is in the best interests of the Company to defer the payment of any dividend on the ordinary shares for the present.—An interim dividend at the rate of 9 per cent. per annum is recommended by the Brompton & Kensington Electricity Supply Co.

**National Electric Construction Co.**—The report for 1913 shows a net profit of £4,827, which it is recommended shall be carried forward. The auditors in their report recommend that the expenditure upon the tramway and lighting concessions at Folkestone and West Yorkshire, viz., £39,932 and £845 respectively, should be written off, as they are now ascertained losses. In view of this recommendation, the directors have considered the need for a re-valuation of the whole of the Company's assets, and now suggest that the £1 shares of the Company should be reduced to 10s.

### NEW COMPANIES

**ELECTROMOBILE (LEEDS)**, 30 Bath Road, Holbeck, Leeds. Capital £1,000. To make and hire electric cars.

**"DAC" ACCUMULATOR SYNDICATE**, Cheshunt Wharf, Cheshunt. Capital £1,000. To acquire patents from the liquidator of the existing "Dac" Accumulator Syndicate.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 399 [VOL. X., No. 34]

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THURSDAY, AUGUST 20, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

WE give further instances of the large number of electrical employees who are serving with the Army and Navy. (Page 461.)

An article by Mr. E. P. Hill deals with certain errors in the arrangement of equalising connections of compound generators that are sometimes met with. (Page 462.)

THE meeting of the British Association in Australia is now in progress. (Page 462.)

WE appeal to British manufacturers not only to manufacture for stock in advance of demands which may confidently be anticipated, but also to use every endeavour to introduce their products immediately in foreign and colonial markets before the business hitherto done with Germany is placed elsewhere. (Page 463.)

In a special article, we review the effect of the war upon the electric lamp industry. It is shown that an almost immediate increase in output may be anticipated, and manufacturers who have not their own glass works are advised to make arrangements for obtaining sufficient supplies of bulbs. Two only of the existing lamp works in this country have their own glass works, and hitherto the greater number of the remainder have had to obtain their bulbs from Germany. (Page 463.)

A QUESTION relating to charge and discharge meters for battery circuits is given in our Questions and Answers columns. (Page 464.)

THE specifications published last week included one dealing with an improved telephone repeater for wire-less work by the Western Electric Co.—The Board of

Trade has been empowered to suspend the patents owned by subjects of any State at war with this country.—A patent for a fire-extinguishing system expires this week after a life of fourteen years. (Page 464.)

THE B.E.A.M.A. has sent a circular letter to the principal large purchasers of electrical plant pointing out the necessity for the continuance of work under all possible contracts. (Page 465.)

NOTES on the arrangements for the next session at some of the Universities and Technical Colleges are given on page 465.

WE are able to give further information as to the interruptions in telegraphic communication due to the war. (Page 465.)

THE equipment of a municipal substation, a new traction lamp, and special designs of searchlights for civil purposes, are described in our Trade Section. (Page 466.)

TRANSFORMERS are required at Rochdale, rotary converters and switchgear at Dundee, and storage battery, &c., at Oldham. Extensions are also to be carried out at Newport (Mon.), Belfast, and Dublin. Tramway permanent way is required at Brighton and Bury. (Page 467.)

THE Dover Corporation has entered into a new agreement for supply to the Admiralty.—Satisfactory results for the past year's working are reported from Portsmouth and King's Lynn. (Page 468.)

W. T. HENLEY's Telegraph Works Co. announce a 10 per cent. interim dividend. (Page 468.)

OWING to many of the leading London tradesmen having had their horses commandeered for military purposes, practically the whole stock of electric vehicles has been cleared out. (Page 468.)

## ELECTRICAL EMPLOYEES WITH THE ARMY

WE give below further instances of electrical employees who are now serving in the Army and Navy and Territorials.

*Siemens Bros. Dynamo Works* (including all works and offices).—Between 130 and 140 men. Full wages are to be paid to married men and half to single men.

*British Electrical Federation*.—849 men from the federated companies in Great Britain and the head office staff of the Federation. (This includes the figures given last week for the North Metropolitan Electric Power Supply Co., the Metropolitan Electric Tramways, and the South Metropolitan Electric Tramways & Lighting Co.) The B.E.F. Mutual Aid Fund, for the relief of dependents of tramway and electric supply men who are called on service has been established by about forty of the federated tramway and electrical companies. It provides for the companies subscribing an amount equal to the total contributions made by the employees who remain at work. The contributions of the companies will not be less than 3d. per week in respect of every man in their employment. The men who have been called out have been given to understand that their places will be kept open for them upon their return. In the event of a reduction of services becoming necessary, the companies will endeavour, by equalising the work as much as possible to avoid reduction of staff.



*General Electric Co.*—100 men from Witton and Birmingham.  
*Ferranti, Ltd.*—70 men.

*Liverpool Corporation Electricity Department.*—All men called out will be reinstated without loss of position or emoluments consequent on their enforced absence. The Corporation will make up the difference between the Government pay and full salary or wage.

*Edison & Swan United Electric Light Co.*—17 men, including one in the Royal Flying Corps.

*British Insulated & Helsby Cables, Ltd.*—300 men.

*Dundee Corporation Electricity Department.*—In addition to the 36 men, including the assistant mains superintendent referred to in our last issue, Mr. H. Richardson, the General Manager of the Department, who resigned from the Royal Engineers a few weeks ago, has rejoined, and has been appointed Commanding Royal Engineer for the Dundee district.

*St. Anne's-on-Sea Corporation Electricity Department.*—A number of men have been called up for service in the Royal Naval Reserve. The Town Council will pay the wives and dependents £1 per week, and an allowance for each child, and situations will be kept open.

*Yorkshire Electric Power Co.*—An allowance is to be made for the wives and children of men called up.

*County of London Electric Supply Co.*—Half wages, with a minimum of £1 per week in respect of all men called up.

*India Rubber, Gutta Percha & Telegraph Works Co.*—Half wages will be paid to the wives and dependents of all employees called up, and employment will be found for them on their return.

## EQUALISING CONNECTIONS ON COMPOUND D.C. GENERATORS

By E. P. Hill

IT has been found, during a period of several years' outside work for a large manufacturing company, that a frequent source of trouble, and even of serious damage to expensive electrical plant, lies in the incorrect knowledge of the function and position of equalising connections. A crop of instances of this kind having recently been brought to the writer's notice, it is hoped that, should any others profit by this article, its aim shall have been fulfilled. In these days of severe competition and specialisation, the switchboard controlling the generating plant is frequently manufactured by another contractor than the machines, and in consequence the engineer representing the customer is responsible for the correct fusion of ideas between the control apparatus and machines.

With all respect to these gentlemen, one sometimes finds they are so occupied in keeping scrap plant in operation, &c., that they fail to enter very deeply into the details necessary for the switchboard designer to arrange matters satisfactorily to suit local conditions, and in consequence the standard design is submitted.

This usually consists of a D.P. switch and a S.P. circuit-breaker, together with the usual meters, &c., for each machine. Should, in the existing plant, the equaliser main be on the positive side, it is frequently found that the circuit-breaker is arranged in the new plant on the positive side, and trouble will develop from the following causes. Referring

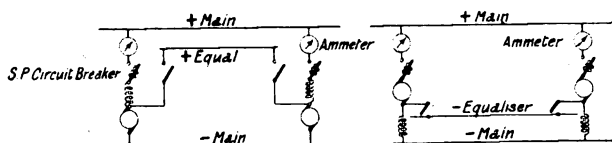


FIG. 1.—EQUALISER  
WRONGLY  
CONNECTED.

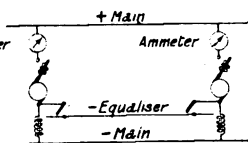


FIG. 2.—CORRECT  
CONNECTION OF  
EQUALISER.

to Fig. 1, it will be noticed that, should for any reason the circuit-breaker operate, the other machine is still capable of receiving power through the equaliser main. I have known instances of machines flashing over from this cause, the trouble being put down to quite innocent causes for lengthy periods of time.

The second trouble which arises in this connection is that the ammeter is usually connected in the same main as the circuit-breaker. The result is that with the equaliser being on the same side, the ammeters are equalised independently of the actual loads on the various machines in parallel. I have seen steam engines motored for lengthy periods by the other set in parallel, the ammeters indicating, however, apparently that the load was equally divided.

The policy of restricting the size of the equaliser is not good, and engineers should err on the side of liberality in copper section.

The rule to be observed, therefore, is that ammeters and circuit-breakers (if S.P.) must be connected up in the opposite polarity from that of the equaliser main, or their functions become useless when parallel running is attempted.

Should it be found that, by oversight or error such a condition obtains, the best method to overcome the trouble is to flash over the polarity of old plant, and reverse the cables at the switchboard, thus bringing the existing equaliser into the negative side (as S.P. breakers are usually in the positive). If this be not practicable, the ammeter must be changed over to the other main, and an additional S.P. breaker added to make D.P. breaker, thus ensuring that power will be cut off when excessive overloads occur.

## THE BRITISH ASSOCIATION IN AUSTRALIA

THE meeting of the British Association for the Advancement of Science in Australia has not been affected by the war, and is now in progress, and several of the sectional presidents' addresses have already been delivered in Adelaide and Melbourne. Sir Oliver Lodge gave an evening discourse on "The Ether of Space," on August 10th, at Adelaide, and the first part of the address of the President of the whole Association (Prof. W. Bateson) was given on Friday of last week at Melbourne. The meetings of Section G (Engineering), in which our readers are more particularly interested, are distributed between Melbourne and Sydney, where Prof. Coker's presidential address will be given to-morrow, and a joint discussion with Section A on wireless telegraphy will be held. The Papers down for reading before Section G include the following:—"Proposed Metropolitan Electric Railway," by Mr. J. J. Bradfield; "The New Engineering Laboratories of the City & Guilds Engineering College," by Prof. W. E. Dalby; "Railways and Motive Power," by Prof. W. E. Dalby; "The Capacity of Radio-telegraph Aerials," by Prof. G. W. O. Howe; and "The Limiting Conditions for the Safe Use of Electricity in Mining," by Prof. W. M. Thornton. The following Papers in the programme of Section A may also be mentioned:—"A Mechanical Analogue of Wireless Telegraphic Circuits," by Prof. T. R. Lyle; "The Pressure upon the Poles of a Carbon Arc," by Prof. W. O. Duffield; "Some Measurements of the Wave-Length in Air of Electrical Vibrations Associated with a Thin Straight Terminated Rod," by Prof. J. A. Pollock. Sir Ernest Rutherford will give an evening discourse at Sydney on "Atoms and Electrons," and one on "Wireless Telegraphy" will be given at Brisbane by Prof. G. W. O. Howe. The meetings will conclude on August 31st.

**Payment for Foreign Material.**—The rights of our enemies, the Germans, in civil courts, as an outcome of the war, has been the subject of special applications in one or two cases of non-electrical interest. On Monday, however, the question arose in connection with a pending action by the Fabrik Elastischer Glühkörper (Elastic "Incandescence Bodies" Works) against the Imperial Lamp Works (Brimsdown), Ltd. The action was for the recovery of £900 for goods supplied, but on behalf of the Imperial Lamp Works, in chambers it was contended that the plaintiffs, being "alien enemies," could not be heard in the courts. In previous cases it has been held that such actions must be "suspended," and it was argued that this did not merely mean a "stay" until peace was declared. On the other hand, it was agreed that the suspension of civil rights was only temporary. Sir John Macdonnell, the Master in the Supreme Court, who heard the application, granted a "stay" with liberty to apply later. The costs of the application were reserved.

**The Motor-Car Trade and the Supply of Magnetos.**—An important meeting of British motor manufacturers was held in Coventry on Wednesday, the 12th inst., for the purpose of making arrangements for the supply of magnetos for motor-cars and motor-cycles. As is well known, large numbers of these have been purchased in the past from Germany, but, of course, this channel of supply is now stopped. A representative committee was appointed to communicate with English electrical firms with the view of obtaining supplies of magnetos in the future, and all firms desirous of entering into these important branches of the motor trade are requested to apply to the Convener of this meeting, Mr. Harry Smith, The Rover Co., Ltd., Coventry. It may be added that some important British firms have already expressed their intention of going into this trade.

**The Incorporated Municipal Electrical Association.**—The Proceedings of the Incorporated Municipal Electrical Association, containing a full report of the recent Birmingham Convention, have now been published.

### AN APPEAL TO MANUFACTURERS

THE events of this month have placed upon manufacturers a responsibility almost as great as that placed upon our Army and Navy. The exhortation to "carry on," and the motto "Business as usual" are being given to them so much as a matter of course that they are becoming little more than catchwords, and yet far more is needed from the manufacturer than these phrases imply if he is to do the utmost service to his country and the best he can for his industry in the present crisis. In the majority of cases business cannot be "as usual," and "carrying on" must be under very different conditions than before the outbreak of hostilities. The slight shortage of workmen due to the calling out of the Reserves and Territorials is not serious, and the duties of the other employees who have joined the colours can also be carried out by those who have had to remain at home; but there are, of course, other respects in which the manufacturer finds himself handicapped. Foremost among these is the financial position. Payments have to be made for wages and current establishment charges, and in the meantime payments from customers are apt to be delayed. Materials have to be bought, and, in some cases, alas, the suppliers of these demand cash or insist on very short credit, for they in their turn are met with a momentary shortage of raw material, or a demand for quick payments from the producers or importers. There is also a natural tendency for both the retail and wholesale customer to limit his requirements to the smallest possible dimensions, and the manufacturer is loth to manufacture for stock under the present adverse conditions, even in the case of standard articles which must eventually be required.

We appeal to the manufacturers to show their patriotism by fighting against these tendencies to inaction. Not only is there already much work to do in manufacturing several classes of stocks which will inevitably be demanded, but there is also much to do in finding and fostering new markets which must exist under the new conditions. Last week we published detailed particulars of the German export to foreign and colonial markets now open to us, and the enormous imports of German electrical apparatus to this country which are now ceasing. The demand from our manufacturers under the latter category may possibly be more or less automatic, although manufacturers—and also factors—will be well advised to have stocks ready for it when it comes; they know the home requirements, they should know full well the exact articles in which they have been defeated by German competition in the past, and they can start manufacturing for the supply at once. In the case of the foreign and colonial markets which have hitherto been buying German goods, however, the case is different. These are of the utmost importance to the manufacturer here and to the present and ultimate welfare of the country. It is reported already that agents from the United States are flocking to the Argentine to get American manufactures taken up in place of German ones, and Great Britain must lose no time in making similar moves in every country in which the previous German trade is worth acquiring.

Let us imagine a buyer, not necessarily in the Argentine Republic, but in Scandinavia, China or Japan, or even in our own dominions across the seas—Australia, British South Africa, or India—or possibly one in England itself; let us imagine this buyer receiving simultaneously one of the numerous circular letters sent out by our manufacturers saying that all quotations are cancelled and deliveries are not guaranteed, and a visit from an American salesman offering immediate execution of orders for any quantities of goods hitherto bought in Germany. Where will this buyer's order be placed? Incidentally, we strongly advise firms to discontinue these circular letters—which are in any

case redundant when a state of war exists—and to replace them with others commencing with the words, "We can supply . . ."

It is not merely to our manufacturers own interests to apply themselves with energy to find new outlets for trade; it is a patriotic duty. There may be a risk to their pockets both in keeping their works in full or nearly full activity, and in incurring increased expenses in connection with their selling organisation; it may be against every one of their business instincts to risk money on pioneer work when money is scarce and dear; but these are risks British manufacturers may well take in the name of patriotism. While men are risking their lives for their country, we at home may at least risk our money in the same cause and fight for Great Britain's supremacy as an industrial nation.

### THE EFFECT OF THE WAR ON THE ELECTRIC LAMP INDUSTRY

OF the industries in this country which will derive immediate benefit by the state of war in Europe, the incandescent electric lamp industry stands out prominently. Although there are no figures available as to the total number of lamps sold annually in the United Kingdom, a rough estimate given us from a well-informed quarter places it at about 12 million metal filament lamps and about 8 million carbon filament lamps. Of this total over 3 million metal filament lamps and about 1½ million carbon filament lamps were imported from Germany last year.

For the moment there may be a considerable drop in the demand, as dealers are nervous about buying in stocks, but this cannot continue long, and there is little reason to doubt that by the end of the year the consumption of lamps will be practically normal—and the 4½ million lamps per annum hitherto imported from Germany will have to be made in this country. This does not represent the total increase in the production, however, for Germany's export trade in lamps was by no means confined to Great Britain. Russia was a far larger customer; France, Switzerland, Italy, Spain, Scandinavia, and South America bought in very large numbers; British South Africa bought several hundred thousand, and the total number of lamps exported from Germany last year was between 50 and 60 millions. Except for the 5 or 6 million lamps sent to Austria, Great Britain should have an excellent chance in this large foreign and colonial market; her chief competitors will probably be the United States, France, and Holland.

Great Britain is already fairly well equipped to supply all her home demands for lamps and a large export trade as well. There are fifteen factories in this country making metal filament lamps. These works are of various sizes—some of them very large, others quite small—but their combined output when worked at their full capacity would probably be equal to the occasion. There are, however, some facts which modify the situation to some extent. Of all these works, two only blow their own bulbs, and the remainder have hitherto, we believe, imported all their bulbs—for the most part from Germany. The two works which possess the special glassworks for this purpose will probably be in a position to supply all the bulbs for their own increased output, but it is doubtful whether they would be able to supply bulbs to the remaining thirteen works. It will be necessary, therefore, for these works either to build the necessary glassworks themselves, or at any rate to take early steps to arrange for the supply of British-made globes. The glass-blowing industry—in fact, the glass industry generally—has been much neglected in Great Britain for many years, and we have come to rely on imports for a very large proportion of our requirements. It will probably be necessary to train glass-blowers, there-

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,405.

Two Chamberlain and Hookham ampere-hour meters, normally connected to read the "charge" and "discharge" current of a battery, were so connected that both meters read "discharge" current. This was done so that the "charge" meter (which accurately registered "charge" ampere-hours) could be used as a check on the "discharge" meter. But on comparing the two meter readings, the "charge" meter was found to be 18 per cent. slow, with the "discharge" meter. What is the explanation of this?—**DELTA.**

(Replies must be received not later than first post Thursday, August 27th.)

### QUESTION No. 1,404.

What are the main requirements to be kept in view in the design of brush holders for large multipolar machines?

Replies to this question will be published next week.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published August 13th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

25,659/13. **Improved Telephone Repeaters.** WESTERN ELECTRIC CO. This applies particularly to repeaters in which the incoming impulses are amplified by being allowed to excite an electromagnet, which in its turn acts upon the diaphragm of a microphone so as to produce large variations of current in the microphone circuit. The electromagnet is enclosed in a hollow metal tube, the top of which is enlarged to receive the microphone. The latter is so constructed as to be easily removable, so that another microphonic element, the diaphragm of which has a different period of vibration, can be easily inserted. This feature is of considerable value for wireless work. Five figures.

27,050/13. **Rivetting Machines.** SIEMENS & HALSKE AKT. GES. The main feature of this invention is the use of high-frequency current having a periodicity of about 500 cycles per sec. This current is supplied at normal pressure, e.g., 220 volts, and is transformed into a heavy current at low pressure. The use of high-frequency supply enables a small, easily handled transformer to be used. The secondary of the transformer consists of a stout copper tube, one end of which is in contact with the tool for forming the rivet head, the other end being connected through leads to the plates which are being rivetted. Three figures.

### Specifications Published To-Day

The following Patent Specifications will be published to day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials,** &c.: B.W.E.M. CO., LTD. (*Westinghouse Elect. & Mfg. Co.*) [Supports for overhead conductors] 11,309/14.

**Dynamos, Motors and Transformers:** SIEMENS BROS. DYNAMO WKS., LTD., and KIEFFER [Dynamo and motor windings] 18,907/13; FERGUSON and JOHNSTONE [Voltage and output regulators] 26,646/13; MENSFORTH [Commutators] 27,746/13; SIEMENS BROS. DYNAMO WKS., LTD. (*Siemens Schuckertwerke Ges.*) [Method of loading frequency converters] 2,408/14; [Starting rotary converters] 8,711/14; SIEMENS BROS. & CO. (*Siemens & Halske Akt. Ges.*) [Winding apparatus] 7,457/14.

**Incandescent Lamps:** SCHRADER [Hand lamps] 26,592/13.

**Instruments and Meters:** LANDIS & GYR GES. [Core for Ferraris meters] 17,480/13; NAT. ELECT. TIME CO. and SWIFT [Railway signalling] 20,684/13; A.E.G. [Watt-hour meter] 4,356/14.

**Switchgear, Fuses and Fittings:** BERRY and MARKHAM [Change-over switches] 16,840/13; [Combined switches and plugs] 16,841/13; AKT. GES. BROWN BOVERI ET CIE [H.T. oil switches] 17,583/13; DOUGHTY and GYTON [Pendant fittings] 21,193/13; MARKS (*Benjamin Elect. Mfg. Co.*) [Shade supports] 23,452/13; HEMMING [Conduit fittings] 26,764/13; SIEMENS BROS. and SCHUPP [Motor starters] 5,514/14, 8,889/14; R. BOSCH [Contacts] 7,685/14.

**Telephony and Telegraphy:** ERICSSON and DAHLSTRÖM [Telephone system] 17,038/13; SIEMENS & HALSKE AKT. GES. [Telephone systems] 17,417/13, 6,628/14; GALETTI [Wireless signalling] 17,859/13; MCGOWAN [Ear caps for telephoning] 22,485/13.

**Traction:** SIMS [Starting and lighting of road vehicles] 20,230/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors and Transformers:** LINCOLN [Synchronous booster rotary converters] 16,095/14.

**Electrometallurgy and Electrochemistry:** SCHOTT & GEN [Manufacture of electrodes] 16,063/14; MÖLLER [Separation of suspended bodies from insulating fluids] 17,175/14.

**Ignition:** LEDERER [Electric gas lamps] 17,036/14, 17,646/14.

**Switchgear, Fuses and Fittings:** SIEMENS SCHUCKERTWERKE GES. [Automatic cut-outs] 17,379/14.

**Telegraphy and Telephony:** MCGAURON [Telephone call recorders] 12,232/14, 12,233/14; LATOURT CIE [High-frequency alternators] 17,872/14.

**Traction:** SOC. ANON. DITE S.T.A.R. SYSTEME DE TRACTION AUTO REGULATEUR [Arrangements for motor control] 15,155/14.

The following Amended Specifications may now be obtained:—

**Traction:** F. C. V. DE CASTELLETO [Vehicle brakes] 9,274/13.

**Miscellaneous:** L. LAFFITTEAU [Sterilisation of liquids] 9,281/13, 9,282/13.

### Suspension of Patents

The Board of Trade has been empowered by Act of Parliament to do anything they think expedient for avoiding or suspending any Patent the proprietor of which is a subject of any State at war with his Majesty.

### Application for Amendment

5,210/09. **Ignition Devices.** SPARKING PLUG PATENTS, LTD., seek leave to the above Specification.

### Expiring and Expired Patents

The following Patent expires during the current week, after a **life of fourteen years**:—

14,875/00. **Fire Extinguishing.** J. F. H. GRONWALD. An apparatus for enabling the fire in a ship's hold to be rapidly located and extinguished. Outlet pipes, from each separate compartment of the hold, are led to the upper deck, and are provided with electric alarm thermometers, so that any hot smoke or gases escaping are immediately detected. Another set of pipes are led to a source of supply of some inert gas, e.g., carbon dioxide, which can thus be diverted into any part of the hold, either to extinguish the fire or to prevent any combustion of the cargo occurring. Three figures.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials,** &c.: B.T.-H. CO. (*G.E. Co., U.S.A.*) [Insulating compounds] 10,208/06.

**Incandescent Lamps:** WOLFRAM LAMPEN AKT. GES. [Metallic filament lamps] 8,416/08.

**Traction:** W. KÖHLER [Overhead collectors for trackless vehicles] 26,907/09.

**Miscellaneous:** P. T. SIEVERT [Apparatus for glass manufacture] 9,853/09; C. H. ROLLISON [Automatic balancing for aeroplanes] 10,299/09.

fore, in order to obtain a sufficient supply of skilled workmen, and an early start should be made.

Another interesting point is that practically none of the brass and vitrite caps of the lamps, so far as we know, are made in this country. The large majority of them come from Holland. This is, however, merely a question of price, and, if circumstances necessitated it, there should be no difficulty in making them here. We believe we are right in saying that a factory was established here, more or less as an experiment, a few years ago to manufacture lamp caps for several lamp-makers, but that it was discontinued as it was found that the foreign caps could be bought at a cheaper price owing to the very large production; for, strange as it may appear, Holland is said to supply lamp caps for the greater part of Europe's requirements. The manufacture of the filaments for metal filament lamps is another question. Several of the English lamp-manufacturers do not make the filaments themselves, but others do. In any case, there are probably sufficient stocks of tungsten or of the filaments themselves to tide over any difficulty of this sort; the question of patents will doubtless have some influence on the situation, but it may be assumed that patent rights will not be allowed to stand in the way of supplying the Country's requirements in lamps.

Before leaving the subject of incandescent lamps, a word may be said as to the half-watt lamp. It has been an open secret that the majority of the half-watt lamps obtainable in this country hitherto have been of German manufacture. Only one firm announces at present that it has a stock of British-made half-watt lamps immediately available. This firm will have a great advantage over its competitors, and it is reasonable to expect that others will follow suit and complete their arrangements for turning out sufficient quantities to meet the demand which will be a rapidly growing one. We may have more to say, in a later article, as to the causes which will contribute to this demand.

\* \* We hope to publish in successive issues further articles as to the effect of the war upon other branches of the electrical industry.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The present position of matters telegraphic may be briefly stated as follows:—The deferred and letter telegram services are suspended by all routes until further notice, except *via* the Atlantic Cable Companies and *via* Marconi, but even in these cases they are subject to exceptional delay and to the general restrictions announced in our previous issues.—The route to Germany by the lines of the Indo-European Telegraph Co. is entirely interrupted, and generally no messages can be accepted for Germany, Austria-Hungary, and Bosnia-Herzegovina.—The Belgian Government states that all telegrams to and from and in transit *via* Belgium must be in plain French, Flemish, or English, and must convey some intelligible meaning. Previous announcements of restrictions are still in force.—The Greek Government has suspended the use of wireless telegraphy on all ships in territorial waters.—All telegrams for the Union of South Africa are only accepted at senders' risk, and no applications for refunds will be considered, whether telegrams be stopped, delayed, or cancelled without notice to senders, or otherwise.—The Russian Government make a similar announcement.—The Austrian Administration confirms that all telegraphic relations with France and French possessions, Serbia, and Montenegro are suspended, including terminal as well as transit traffic.—Telegraphic correspondence with Great Britain and Belgium is entirely suspended.

The United States Government has established censorship over radio-telegraphic communication, and the Press states that this has never before arisen in a war, and that the action of President Wilson establishes a precedent. The

proclamation first confirms neutrality, and states that all radio-stations are hereby prohibited from transmitting or receiving for delivery messages of an unneutral nature, and from in any way rendering to anyone of the belligerents any unneutral service during the continuance of hostilities. There are, the *Sun* states, 200 or more public and Government wireless stations in the States, which are divided into nine districts. Some trouble is anticipated owing to the large number of amateur stations.

The Italian Government state that code and cipher is only admitted in Government and diplomatic messages, whether telegraphic or radio-telegraphic. Consular agents may send or receive messages in plain Italian, German, or French.—The French Government will no more accept telegrams with abbreviated addresses or signatures, nor telegrams having transited the German or Austro-Hungarian lines, or those of their Protectorates.—Telegrams to or *via* Roumania must be written in German, French, English, Italian, or Flemish.—The Tokio-Bonin cable is interrupted, and occurring at this time it may be well assumed that the cause is due to the estrangement between Japan and Germany, being a Japanese Government cable. It has, however, failed on a previous occasion through natural causes.

For some time a daily newsletter has been sent by wireless telegraphy from the Marconi station at Chelmsford to the *Algemeen Handelsblad*, in Amsterdam. The Dutch authorities were sceptical that this really arrived by wireless until they succeeded in picking up the message. The practice has been stopped as an infringement of the postal law.

### THE B.E.A.M.A. AND THE WAR

THE following letter has been sent by the chairman of the Council of the British Electrical and Allied Manufacturers' Association to the principal railways, corporations and other large purchasers of electrical plant and apparatus.

There are many evidences of a tendency on the part of purchasers (by no means the smallest) to take advantage of clauses in their contracts to suspend and delay work on account of the war; and the members of this Association, who employ tens of thousands of working men, are already so affected in respect of contracts representing over a million pounds sterling. Should such suspension and delay become at all the common practice, the result, for working men, would be disastrous. One of the primary duties of every Britisher at the present moment is to maintain employment as far as ever possible; and my Council desire to appeal for the prompt and sympathetic consideration of this question by all present or prospective purchasers of electrical goods and goods used in connection with electrical work. Our own Government, by common consent, has set an excellent example, financially and otherwise, and has given every assurance towards allaying traders' fears. The Colonial Governments have done the same, notably the Australian Government, who have publicly exhorted their own importers to keep up and extend trade with Britain, recognising at once the extremely important issue involved, both now and in the future. On behalf of the Council of this Association I commend this matter to your earnest consideration.

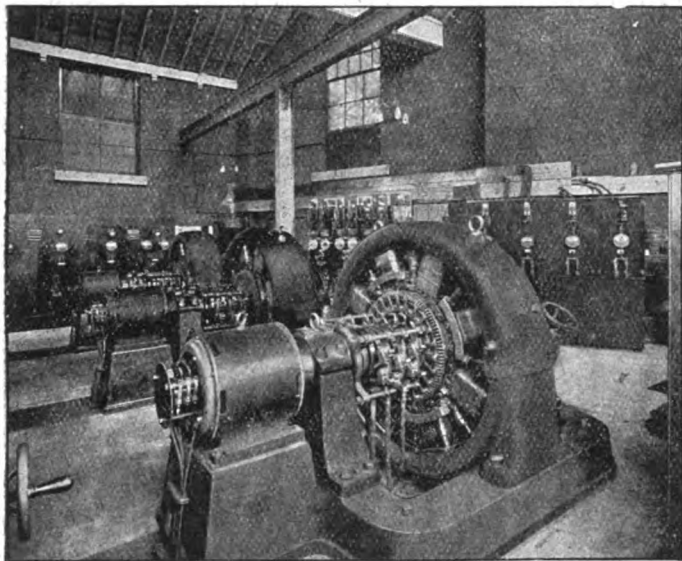
**War on German Trade.**—In view of the cessation of Germany's and Austria's overseas trade, the Colonial Office has telegraphed to some of the more important Colonies possessing responsible government to ask them for full information and samples of the principal imports to them from these countries. It is understood, also, that similar particulars from the Trade Commissioners in the various self-governing Colonies are also on their way to London, and the Foreign Office is sending a request for similar material to H.M. Consuls in some neutral foreign countries. When collected, the samples will probably be exhibited at the Imperial Institute. Although this information will undoubtedly be of some assistance to the electrical industry, our manufacturers should have already good knowledge of the details of the German electrical material sold abroad, and need not postpone their activities until the arrival of samples. In this connection, we refer our readers to the article headed "An Appeal to Manufacturers" on page 463 of this issue, and also to the detailed statistics of German exports published in our last issue. It is possible that the publication of these details—which were quoted by some leading daily newspapers—has assisted towards the action which the Government is now taking.



## "ELECTRICAL ENGINEERING" TRADE SECTION

### A MUNICIPAL SUB-STATION

THE Manchester Corporation have recently laid down a rotary-converter sub-station at the large carriage works of the Great Central Railway Co., in Manchester, to transform three-phase current at 6,600 volts 50 cycles to continuous current at 225 volts. The converting plant consists of three 300-kw. "Witton" rotary-converters, running at 750 r.p.m., and fed from a bank of three-phase oil-insulated, self-cooling transformers. The reactance method of voltage control is used, sufficient reactance being embodied in the



SUB-STATION AT G.C.R. CARRIAGE WORKS, MANCHESTER.

transformers. For starting, a slip-ring induction motor is carried on an extension of the shaft of each set with a three-phase liquid starter. The necessary synchronising gear is carried on a set of small panels between the starting motor and transformer. The General Electric Co., Ltd. (Witton, Birmingham, and 67 Queen Victoria Street, London, E.C.), were the contractors for the rotary-converters and control gear.

### A NEW TRACTION LAMP

A NEW form of traction lamp with a drawn-wire tungsten filament has been put on the market by Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston). These are being

manufactured in England, and have spiralised filaments carried on spiders in the usual manner. Instead of the filament being wound up and down, as has been the case previously, the spider is arranged so that equal lengths of filament are carried vertically and horizontally. By this means neighbouring lengths of filament do not run parallel to each other, as with the existing method, which is liable to cause twisting or short-circuit of the filaments owing to vibration, but are set at right angles; and no bend is greater than a right angle. In practice, therefore, it is impossible to obtain a short-circuit, even under the most violent jars or vibration, and the lamp is equally strong when used in any position. The new arrangement accounts for a considerably increased spherical



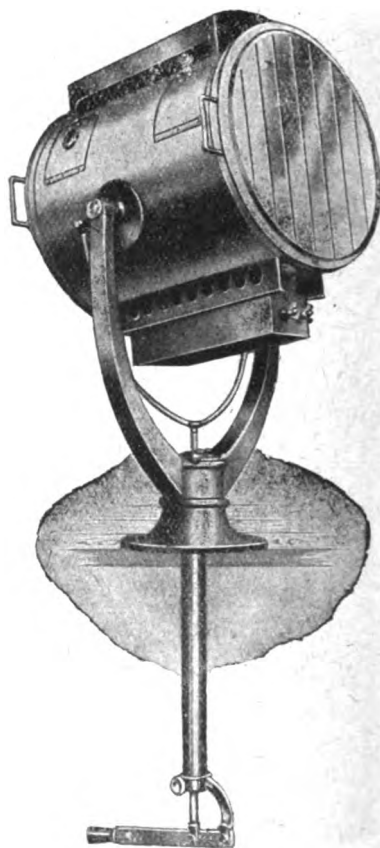
WOTAN TRACTION LAMP.

candle-power, as the light given is practically uniform in all directions other than the cap end. The distance be-

tween the top and bottom supports of the spider is in no case greater than three-quarters of an inch, in order to provide the lamp with a mechanical supporting strength hitherto unobtainable, and it is practically impossible to break the filament or stem without breaking the glass of the bulb. Many exhaustive tests have been carried out on these lamps under severe artificial conditions of vibration, as well as on rolling-stock in use, and the results obtained lead to the belief that the longest possible average life will be obtained. The prices are the same as those of the previous Wotan traction lamps.

### SEARCHLIGHTS

WE illustrate here a pattern of wheel-house searchlight made by the London Electric Firm (George Street, Croydon), of which a number have just been completed for a large Scottish shipbuilder for use on passenger steamers. They are of the 20-in. size, constructed of brass throughout, and are fitted with high-grade silvered parabolic mirrors and diverging lenses. The firm have also developed another type for fire brigade purposes. These constitute a new development of searchlight work, and are for use in illuminating shadow-cast exteriors and dark interiors of buildings. They are extremely light, to enable them to be carried about easily, and very strong, to stand the rough work inevitable with such service. The lantern, which is arranged for tilting and swivelling, is carried on a tripod made to collapse by means of sliding members, and also to fold up, thus giving the maximum of advantage for transport purposes. A widely dispersed beam of light is produced, and the candle-power is given as 3,000.



PILOT HOUSE PATTERN OF SEARCHLIGHT.

### CORRESPONDENCE

MESSRS. A. P. LUNDBERG & SONS.

*To the Editor of ELECTRICAL ENGINEERING.*

SIR,—We should like an opportunity of correcting erroneous statements which have been made in various quarters to the effect that our stocks are dependent on Continental supplies, and that we act as "distributors" for German manufacturing firms.

The exact opposite is the case, for we have no factoring interests, and are essentially an English manufacturing firm.

Our business as manufacturers of electrical accessories was established in London over 32 years ago. Our Senior Partner is a naturalised Englishman of Swedish birth, whose home has been in this country for over 50 years. Our Junior Partners are both London born, the sympathies of the firm are entirely British, and our capital is all invested in this country.

Trusting that you will afford us this opportunity of removing an erroneous impression, which, unless the facts are stated, will prove detrimental to our interests.

We are, Sir,  
Yours faithfully,  
A. P. LUNDBERG & SONS.

London, August 13th, 1914.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**SWITCHGEAR.**—A new collection of leaflets from A. Reyrolle & Co., Ltd., Hebburn-on-Tyne, describe some recent additions to this firm's manufactures, including special dividing boxes for transformers, in which six leads are brought from the separate phase windings and mesh connections made inside the box, and a rotary pattern of isolating switch on cast-iron base with porcelain insulation. Other leaflets deal with quick-break switches, fuses, plug boxes, enclosed starters, and time-limit relays.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**QUICK-BOILING KETTLE.**—A leaflet just issued by the B.T.-H. Co. (Rugby) describes an electrically-heated kettle which is designed to meet the demand for a cheap and reliable article of this kind. The body is of copper, tinned on the inside to prevent corrosion, and the heating element consists of "calorite" metal ribbon wound upon a mica former. Two pints of cold water can be raised to boiling point in ten minutes with an energy consumption of  $\frac{3}{4}$  kw.

**STARTING COMPENSATORS.**—A further list from the same Company gives some interesting particulars of their starting compensators for squirrel-cage induction motors. The compensator consists essentially of an auto-transformer, which lowers the pressure across the motor terminals during the period of starting, which, by the way, should be about one minute. The use of these compensators reduces the rush of starting current, and also the starting torque, in proportion to the square of the reduction in voltage.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Dover.**—A sum of £1,000 is to be borrowed for services.

**Dublin.**—The Corporation has arranged to borrow £80,500 from the Bank of Ireland for the purpose of electrical extensions.

**Dundee.**—Rotary-converters and switchgear are required. General Manager. August 31st. (See an advertisement on another page.)

**London: L.C.C.**—Tenders are invited for the reconstruction of motor-generators in the tramway southern sub-stations. Clerk. September 8th. (See an advertisement on another page.)

**Minster.**—The question of providing an electricity generating plant for the Union is to be considered.

**Newport (Mon.).**—A loan of £16,000 is to be taken up for electrical extensions.

**Oldham.**—A storage battery, reversible booster and battery is required. Joint Electrical Engineer (Mr. F. L. Ogden). August 24th.

**Rochdale.**—Twelve months' supply of static transformers. Borough Electrical Engineer.

**Swinton.**—Alterations to the switchboard are required.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Birmingham.**—New school in Ryland Road, Erdington.

**Bristol.**—Public baths. Gloucester Road.

**Heywood.**—Extensions at Hope Mill.

**London.**—Charterhouse Telephone Exchange. H.M. Office of Works, Storey's Gate, S.W.

**Manchester.**—Alterations, Crumpsall Workhouse. Architect, A. J. Murgatroyd, 23 Strutt Street.—Public baths at Failsworth. Architects, Woodhouse & Howard.

**Wigan.**—Cinematograph theatre. P. Gaskell.

### Miscellaneous

**Belfast.**—An electric motor tower wagon is required by the Tramways and Electricity Department. City Electrical Engineer. August 24th.

**Brighton.**—Manganese steel tramway points and crossings. Tramway Manager. September 7th.

**Bury.**—Permanent-way and overhead equipment for  $1\frac{1}{2}$  mile of tramway. Tramway Manager.

**Peterborough.**—The Rural District Council is introducing electric pumping at their sewage works.

**South Wales.**—The Powell Duffryn Steam Coal Co. require a twelve months' supply of electrical stores. Particulars from Stores Manager, Aberaman, near Aberdare, and tenders to Company at 101 Leadenhall Street, London.

**Walthamstow.**—Tramway materials, including rails, castings, fish-plates, anchors, bolts, &c. Borough Surveyor. August 19th.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although no official quotation is obtainable, the price of copper may be taken as from £70 to £72.

**Prices of Osram Lamps Unaltered.**—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), announce that, owing to the war, they have to withdraw all outstanding quotations and special terms, and that they may not be able to adhere to all guarantees and promises of delivery. All the Company's factories are still open, and every endeavour is being made to cause as little inconvenience as possible. The prices and conditions of sale of Osram lamps remain unchanged, but responsibility for damage in transit cannot be entertained.

**Agency.**—Fraser & Chalmers, Ltd. (Erith, Kent), have appointed Mr. H. A. Sturgess (The Oak, Motherwell) to represent them in Scotland.

**Crompton & Co.**—We are advised that Messrs. Crompton & Co. are very busy on Government orders, and are working night and day to expedite delivery, which is of national importance in the present crisis. Every effort, however, is being made to meet the requirements of customers in the most expeditious manner in the circumstances.

**Liquidation.**—A meeting of creditors of the National Electric Time Co. will be held at the offices of Messrs. Vincent & Goodrich, 9-10 Pancras Lane, E.C., on August 27th, at 3 p.m.

**Agency.**—The British Electrical Plant Co., Ltd. (Alloa, N.B.), have appointed Mr. Allen Williams (9 Queen Victoria Street, E.C.), as their agent in London and south of England. Mr. Williams also represents Eckstein, Heap & Co., Ltd. (Manchester), for switchgear, and The Anderston Foundry Co., Ltd. (Glasgow), for steam engines, air compressors, &c.

**Fittings.**—Nathan & Allen (Queen Anne's Chambers, Westminster), inform us that as their standard lanterns and fittings are of British manufacture (except a few special forms of glassware), they are independent of Germany, and, having good stocks of finished fittings and raw materials, are able to give their usual prompt despatch of orders. Prices will not be advanced unless absolutely necessary. They are preparing a catalogue of new designs, which will contain, amongst others, the "Orient Lantern," for half-watt lamps for shop-front lighting; an improved street-lighting fitting; semi-inverted "Opalba" bowl fittings; and a new semi-inverted fitting for half-watt lamps.

**The London Electric Firm.**—This firm inform us that they are carrying on as usual all their manufacture at George Street, Croydon, of lamp-lowering gear, &c., all of which is British made. Large stocks are in hand. Their searchlights (see page 466) are also entirely made at Croydon, and prompt deliveries can be guaranteed.

**Belgian Relief Fund.**—The Belgian Minister in London has opened a fund to relieve the distressed families of the Belgian soldiers now in the field, and to afford help to the sick and wounded. Contributions may be sent to the Belgian Legation, 15 West Halkin Street, S.W., or to Louis Godechaux, President of the Belgian Chamber of Commerce in London, 155 Fenchurch Street, E.C., marked "Belgian Relief Fund." All contributions will be acknowledged through the "Public Ledger."

**Meter Approved.** The Board of Trade has approved of a meter deposited on behalf of Messrs. C. H. W. Gerhardt, known as the "Met" single-phase alternating current 2-wire watt-hour meter Type T.O., and of the means for fixing same.

## LOCAL NOTES

**Bury St. Edmunds: Interruption of Supply.**—On Wednesday of last week a brief interruption of supply was produced which affected a portion of the public lighting, the Post Office, and surrounding district. The trouble was caused by a short-circuit on the network which threw out the circuit-breaker of the generator at work. A battery is in course of erection, which, had it been complete, would probably have prevented the interruption.

**Dover: Supply to Admiralty.**—An agreement is to be entered into with the Admiralty for five years for a supply of electrical energy for lighting and power on the following terms:—Lighting up to 50,000 units per annum (minimum 30,000), 3½d. per unit; between 50,000 and 100,000 units, 2½d. per unit; between 100,000 and 150,000 units, 1½d. per unit; above 150,000 units, 1d. per unit. Power:—Up to 20,000 units per annum 2½d. per unit; over 20,000 units, 2d. per unit.

**Great Harwood: Electric Lighting.**—The revocation of the electric lighting Order, which should ordinarily expire this month, has been postponed for twelve months by the Board of Trade.

**King's Lynn: Electricity Accounts.**—The accounts of the Electrical Department for the year to March 31st, 1914, show a balance of £4,663 carried to net revenue account. The balance carried forward for the previous year was £2,388, and after meeting capital charges and allocating £257 towards expenditure on meters and mains, the net revenue account shows a balance of £3,908. The total number of units sold was 669,874, against 559,647 in the previous year. The load factor improved slightly from 16·42 per cent. to 16·99 per cent.

**Portsmouth: Electricity Profits.**—There was a net profit of £3,342 upon the electricity undertaking last year. The Corporation has decided to allocate a good portion of this to relief of rates.

**Springhead: Electric Supply.**—The Council, jointly with the Lees Urban District Council, is asking the Oldham Corporation to obtain an electric lighting Provisional Order for these two districts.

## THE PRINCE OF WALES' NATIONAL RELIEF FUND

PERSONS in all walks of life in this country will have read the special appeal by the Prince of Wales for funds to be used for the relief of the distress caused by the war among those least able to bear it, and we cannot doubt that our readers will be liberal in their response. In order to assist them in the performance of this national duty we give the coupon below, which may be used for forwarding contributions of any magnitude. Needless to say, the smallest contributions will be as gratefully received as those from subscribers of large means.



I enclose £      s.      d. towards the Prince of Wales'

### NATIONAL RELIEF FUND

Name .....

Address .....

This coupon should be filled in, and the envelope, which need not be stamped, addressed to H.R.H. The Prince of Wales, Buckingham Palace, London.

## APPOINTMENTS AND PERSONAL NOTES

Having regard to the present state of affairs, proposals to increase the salaries of Mr. N. Appelbee and Mr. Holt, Electrical Engineer and Tramway Manager respectively at Ashton-under-Lyne, were withdrawn at a meeting of the Council last week.

Mr. Charles Furness, Electrical Engineer and Tramways Manager to the Blackpool Corporation, left on August 12th for Eysden, Holland, near the Belgian border, to bring home his fourteen-year-old daughter, who was at school there. We are pleased to hear that Mr. Furness has arrived safely back with his daughter.

Mr. Dunlop, Secretary of the B.E.A.M.A., who was in Zurich when the war broke out, has now returned to London. He left Zurich on Wednesday last week, and only arrived in Paris at noon on Saturday. The journey from Zurich to Geneva took a day and a half, and a like time was occupied between Geneva and Paris, both under extremely uncomfortable conditions.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**W. T. Henley's Telegraph Works Co.**—An interim dividend at the rate of 10 per cent. per annum, free of tax, is declared upon the ordinary shares for the June half-year.

**South Metropolitan Electric Light & Power Co.**—The usual interim dividends are announced upon the seven per cent. cumulative first preference shares and the six per cent. cumulative second preference shares.

**Tyneside Electrical Development Co.**—An interim dividend of 5 per cent. is declared.

**Waste Heat & Gas Electrical Generating Stations.** An interim dividend of 2½ per cent. is announced.

**Bournemouth and Poole Electricity Supply Co.**—A circular has been sent to the ordinary shareholders expressing the directors' opinion that it is advisable, in view of the present financial conditions, to conserve the cash resources of the company. It is therefore proposed to postpone the payment of their interim dividend on the ordinary shares announced on July 9th.

**A "Run" on Electric Vehicles.**—Owing to so many horses having been commandeered for Army purposes, it is stated that large tradesmen in London and elsewhere have been hard put to keep pace with their deliveries. Many petrol motor lorries are also being requisitioned by the war authorities. It is not surprising, therefore, that all the small stock of electric commercial vehicles has already been bought up, and the prospects are encouraging for an extension of the manufacture of electric vehicle chassis; there should be no difficulty in obtaining the necessary batteries.

Edison Accumulators, Ltd., have even sold all their demonstration cars, and have urgent orders from present users for further vehicles. Similarly, the Torpedo Electric Motor Co. has sold all its stock of vehicles, and Messrs. Mossay inform us that had they had in stock another two dozen vehicles they could have sold them. All this has happened since the declaration of war. The agent in this country for the French-made F.R.A.M. vehicles was expecting a batch over from France towards the end of the present month, but there are doubts whether these will be delivered for some little while now.

**Electric Light Switching Examination.**—Following is a complete list of successful overseas competitors in the last examination in electric-light switching conducted by Messrs. A. P. Lundberg & Sons (Liverpool Road, N.).—*Advanced Grade*:—A. W. Honychurch, Christchurch, Barbados, West Indies; H. S. Tiley, Potchefstroom, South Africa. *Intermediate Grade*:—H. R. Constantine, Zug, Switzerland; R. Drilhon, Pau, France. *Preliminary Grade*:—H. Cristall, London, Ontario, Canada; A. K. Dass, Delhi, India. The next examination will be held in November, in connection with ELECTRICAL ENGINEERING, as our readers may remember.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 400 [VOL. X., No. 35]  
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THURSDAY, AUGUST 27, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

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Displayed Advertisements, Tuesday first post.  
Corrections in Standing Advertisements, Monday first post.  
All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

FURTHER particulars are given of electrical employees serving with the Army and Navy. (Page 469.)

WE publish further particulars of the prospects of electrical trade in various countries in which Germany has hitherto occupied the market to better effect than Great Britain, and these, taken in conjunction with the details of German export trade published in our issue of August 13th, will doubtless be useful to manufacturers. (Page 470.)

THE threatened shortage of carbons will be averted so far as flame arc lamps are concerned. We give a review of the situation, and publish an important letter on the subject from the General Electric Co. (Page 470.)

THE French Government are allowing the fee usually payable on application for patents to be deferred till after the war. (Page 471.)

THE design of brush holders for large multipolar machines is discussed in our Questions and Answers columns. (Page 472.)

THE Institution of Electrical Engineers has a register of men willing to assist in the maintenance of electric supply and other public services. (Page 472.)

NOTES on the arrangements for the next session at some of the Universities and Technical Colleges are given on page 472.

A CONSIDERABLE number of contracts for tramway rails and tyres which had been placed abroad are now likely to pass to British firms.—The Conference of the Municipal Tramways Association has been cancelled.—Electric traction was dealt with in a Paper by Prof. W. E. Dalby at the Australian meeting of the British Association. (Page 473.)

A PAPER on the capacity of wireless telegraph aerials was read by Prof. G. W. O. Howe at the British Association.—Notes are given on the further restrictions in telegraphic communication on account of the war. (Page 473.)

AN improved method of wireless signalling, the manufacture of conduit fittings, and a device for starting rotary-converters, were contained in some of the Specifications published last week.—Opposition has been entered to the grant of a Patent for an improved magneto. (Page 474.)

THE regulations dealing with applications for suspending British patents granted to Germans and Austrians are given. (Page 474.)

OUR Trade Section contains articles on a glass works for the manufacture of lamp bulbs, and some new enclosed switches, &c. (Pages 475 and 476.)

CABLE is required at Liverpool and Wimbledon; a private generating plant at Bradford; electric lighting fittings at Torpoint; plant extensions at St. Pancras and Colwyn Bay; telephone apparatus in Australia, and tramway extensions at Leeds. (Page 476.)

THE importance of showrooms and wiring powers are referred to in the annual report of the South Shields Borough Electrical Engineer.—The Diesel engine supplied to the Wallasey Corporation is to be taken back by the contractors.—The Tasmanian Hydro-Electric Power Co. is to be purchased by the Government. (Page 477.)

## ELECTRICAL EMPLOYEES WITH THE ARMY

WE give some further information with regard to electrical employees who are now serving with the Army and Navy and Territorial Forces.

*Western Electric Co.*—39 men have been called to the Reserves, and 62 to the Territorials.

*St. Marylebone Borough Council, Electricity Department.*—21 members of the staff have been called up and probably four others will join shortly. The Council has decided to reinstate all men so affected, and to pay the difference between ordinary wages and the Army pay.

*Brighton Corporation, Electricity Department.*—35 men. This is a very considerable percentage of the staff, but Mr. J. Christie, the Borough Electrical Engineer, informs us that he has been able to make arrangements to carry on in their absence and that all posts will be kept open. The Council will pay either half wages or make the amounts received by dependents what it was in normal time.



## OPENINGS FOR THE EXTENSION OF OUR ELECTRICAL EXPORT TRADE \*

THE Board of Trade have issued an interesting and useful pamphlet to assist electrical manufacturers in making the immediate attack on foreign and colonial markets recommended in our issues of August 13th. The publication commences with some extracts from German trade statistics as to their exports; we do not quote these in full as they are not quite so complete in all respects as those published in our issue of August 13th, and apply to the year 1912, whereas ours were actual figures for last year. The general conclusion is the same, however; there is an enormous amount of trade to be obtained by individual energetic action in the countries which have hitherto been buying German electrical goods. If we were to obtain all the German electrical trade in electrical machinery in British South Africa, Australia, Russia, Norway, Holland, France, Spain, Italy, Greece, Roumania, Bulgaria, Turkey, Japan, Argentine, Brazil, Chile, Uruguay, and Mexico, which are the principal German markets, we should treble our exports to these countries; in 1912 Germany and Austria sent £2,583,000 worth of dynamos, motors, and transformers there, as against Great Britain's export to the same countries in 1913 of £1,336,100 of electrical machinery.

Some detailed figures of Austria's exports are given in the Board of Trade returns, but the totals are but a fraction of Germany's, and the markets are practically the same.

The chief value of the present paper issued by the Board of Trade is in the interesting collection of extracts from reports emanating from Trade Commissioners and Consuls during the past year or so, which when read now give clear indications as to how we can profit by the new conditions.

**South Africa.**—The following tabular statement gives imports into South Africa during 1913:—

	From the U.K.	From Germany.	From Austria.
Cables and Wires ... ..	£170,000	£71,000	£2,000
Fittings, including posts ...	£155,000	£67,000	£1,000
Electrical machinery ... ..	£142,000	£253,000	—
Telegraph and telephone material	£10,000	£1,000	—
Tramway rails ... ..	£2,000	£14,000	—
Tramway rolling stock ... ..	£16,000	£1,000	—

The magnitude of the electrical trade in South Africa can be gauged by the fact that the imports of electrical goods during the last six years have amounted to £6,000,000. It is stated that latterly trouble with some of the foreign-made plant has occurred "to an alarming extent," and that faults have developed due not only to over-rating, but also, in some cases, to bad design and manufacture. One reason why foreign firms have been more successful than British firms is that they have carried good stocks and have not kept the mines waiting for deliveries. At present the chief opportunity for British manufacturers of heavy machinery will only be for extensions and renewals of existing plants. Makers are advised not to rate their switches and circuit-breakers too high, as they are apt to be overloaded, and it is said that in the case of smaller switchgear mechanical strength is often neglected. Germany in 1912 supplied about 70 per cent. of the three-phase motors, generators, and accessories, Great Britain 20 per cent., and the United States 10 per cent., so that with proper representation and readiness to supply promptly, the German trade should go to us rather than to the United States. The supply of lamps has been practically entirely in the hands of German manufacturers. In 80 per cent. of the electric winding plants erected, the electrical portion is of German manufacture, although Great Britain supplies the bulk of the mechanical portion. Electrically-driven air-compressing plant is divided among British, German, and American manufacturers in the approximate proportion of 30, 60, and 10 per cent. respectively; practically all air-compressors are electrically driven. Referring to rock drills, the report says: "An electric rock drill of absolutely reliable and simple construction would be greatly appreciated, but nothing of this type has proved practical." In Port Elizabeth, Germany's electrical imports in 1912 were large, but only second to Great Britain except in the case of electric lamps. Lamps with B.C. caps are used.

(To be continued.)

## EFFECT OF THE WAR ON STREET LIGHTING

A DANGER which has been realised by many electrical engineers, ever since the German and Austrian mobilisation began, is that it might become increasingly difficult to maintain the lighting of our streets by arc lamps. Practically all the carbons which have been used in these lamps are imported from Germany and Austria. There is one carbon factory in this country—that of the General Electric Co., of which we shall have more to say presently—capable of supplying from 10 to 15 per cent. of the total carbons used; there are small factories in Spain (the Compañía Fabril de Carbones Electricos of Barcelona), in France (Fabrius Henrion of Nancy), in Switzerland (the Elektrocarbon A.-G. of Zurich—formerly G. A. Pestalozzi and Co.), and a large carbon works in the United States (the National Carbon Company, Cleveland). None of the foreign works, however, will be in a position to send any large quantities of carbons to this country, as they have their own countries' requirements to supply; Switzerland and the United States have been supplementing their own production with large purchases from Germany and Austria; the Spanish company can, in any event, send comparatively few carbons over here, and the French company's works at Pagny-sur-Moselle are situated almost in the midst of the present military operations on the French frontier.

It will be seen, however, that arrangements are being made—but with some difficulty—to prevent a carbon famine, and at any rate to keep going the portion of our public street lighting which is supplied by the more modern flame arc lamps. The use of the older open-type arc lamps will perhaps be no longer possible as stocks of carbon run out, but in any case they would be superseded either by flame arc lamps or metallic filament incandescent lamps in the course of time.

The General Electric Company's carbon works were started some twelve years ago, but have always been run at a considerable loss, as they were unable to compete with the lower-priced foreign carbons. We believe we are right in saying that not a single electric lighting authority (either municipal or company) and but one out of all the railways companies have been using British-made carbons for several years. With patriotism and foresight, the carbon works have, however, been kept in operation, and at the present juncture are the only works upon which the Admiralty have had to depend to maintain a sufficient stock of carbons for the searchlights. Since the outbreak of the war, they have been at work night and day practically manufacturing only for the Admiralty, but now apparently they are able to turn their attention to supplying the needs of the railways and electricity supply authorities for street lighting. The letter from the company, which we publish below, shows that the supply of flame arc lamp carbons will, as we have said, be maintained; supplies for purposes for which there is no urgency, and the hoarding up of stocks will be prevented by keeping up prices. They will also make other types of carbons to a limited extent, and will also make suitable carbons for cinematograph theatres. The last-mentioned might be deemed unnecessary, but a simple manufacturing expedient renders it possible; the carbons used for cinematograph lamps are of the same material as those for searchlights, but of smaller diameter, and the "throw-outs" in manufacture can therefore be cut down and utilised.

In the present crisis the General Electric Company have acted in a thoroughly public-spirited manner. They approached the Board of Trade almost immediately after the outbreak of the war, suggesting that the Board should establish an independent authority for the purpose of distributing the output from the carbon works and the various stocks held in the country to the best advantage, and offering them the output

\* Previous articles, "Germany's £14,500 Export Trade Analysed," "An Appeal to Manufacturers," and "The Effect of the War on the Electric Lamp Industry," appeared in our issues of August 13th and 20th.

of the works for this purpose. This offer was, however, not accepted by the Board of Trade, who, however, immediately took the step of urging the electricity supply authorities to economise their carbons and to replace arc lighting by other forms of lighting, wherever possible. Such measures will, it may be hoped, only now be necessary in isolated cases.

The letter which we have received from the General Electric Company is as follows:—

*To the Editor of ELECTRICAL ENGINEERING.*

SIR,—As it is impossible for us to explain the position in the arc lamp carbon industry individually to all inquirers and users, we should be glad of the hospitality of your columns for this purpose.

Our carbon works is the only factory in Great Britain, and the enormous preponderance—approximately nine-tenths—of the carbons used in this country have been imported from abroad from factories in Germany, Austria, and France, which for some time to come cannot send supplies. A very small percentage of the carbons imported came from small Swiss and Spanish works, who can do little, if anything, to relieve the situation. A factory exists in the United States, but will be called upon to make up for the large American demand hitherto supplied by Germany. In addition, it must be remembered that the British Dominions have been large buyers of German-made carbons.

Under the now prevailing circumstances, we have not been surprised, during the last three weeks, to receive enormous demands for carbons for both immediate and forward delivery. In less than a week we could have sold our output a year ahead. A few of these inquiries come from our old customers; the majority from the large users, such as railway companies and municipalities, who have consistently refused us their support in the past, on account of the cheaper prices of German and Austrian carbons. Our endeavours to educate users to the necessity of supporting the only English works with only a small portion of their requirements have been constant for 12 years, but without practical results.

When our works were started 12 years ago the prices ruling for carbons were about double those recently prevalent in this country. The starting of our works was met by a persistent policy of price-cutting on the part of our competitors, which at once made the factory unremunerative. In spite of this we have kept our works running, because we recognised the possible disaster if this country had not at least one source of home supply. This policy has involved our company in a loss amounting to over £70,000, which has naturally not encouraged us to increase the factory to a size capable of supplying a reasonable share of the English demand.

We are, therefore, now faced with a demand some ten times as great as we can satisfy. After serious consideration, we have decided to act upon the following principles:—

(1) In the first place, we shall of course supply all Naval and Military demands.

(2) We have raised prices, not merely to a remunerative level, but sufficiently to prevent buying by those who are not in absolute need. In this connection, we realise that it is possible for many of the largest users to replace temporarily their arc lamps by other forms of lighting, such as metal filament lamps, and those who are in this position should be encouraged to do so.

(3) We shall dispose of our present stock of carbons of all kinds according to the above principles, but as far as manufacture is concerned we shall adhere to the programme described below.

(4) We propose to limit our manufacture to as few types and sizes as possible in order to obtain the maximum output from our existing works.

We would point out in this connection that by reducing the number of sizes we make, our output can be very materially increased, as the machinery can be utilised to the best advantage.

In deciding what sizes we shall make, we have been principally guided by the consideration of what types of arc lamps can best be replaced by other forms of illuminants, and as far as possible we are therefore confining our manufacture principally to those types of arc lamps which in our opinion cannot easily be replaced.

We propose, therefore, in the first place to make carbons for magazine flame lamps—as there are many thousands of such lamps in use of two or three well-known makes using the same sizes of carbons. Subject, of course, to possible Government requirements our output of these magazine carbons should be sufficient to meet all demands. These carbons are 9 mm., 8 mm., and 7 mm. in diameter in 15 in. and 12 in. lengths. Similar carbons with the addition of 10 mm. diameter—if provided with metal cores—can be used in these lengths in practically all converging carbon flame lamps.

Secondly, we shall manufacture a certain quantity of 11 mm. and 13 mm. enclosed lamp carbons in 12 in. and 10 in. lengths, as enclosed lamps are used for certain purposes for which other sources of lighting are not suitable.

Thirdly, we propose to make a certain quantity of carbons for projection work for cinematograph and similar purposes, where the quantities are comparatively small, and where also any other source of light is inadmissible. The stoppage of these supplies would paralyse the whole trade, and cause very great distress.

As we realise that the amount of open type carbons which we could by any means produce would be a mere drop in the ocean, we shall discontinue for the time being the manufacture of these entirely.

We are confident that, in taking this course, we are acting in the best interest of carbon users and the public generally, and hope our policy will meet with general support. Individuals will realise that, where it is absolutely impossible to satisfy all, we are taking a course which enables us to satisfy the greatest number in our power.

Yours faithfully,

For and on behalf of the General Electric Co., Ltd.,  
K. ALWOOD (Secretary).

The position of some of the electricity undertakings with regard to carbons is as follows:—

*Birmingham.*—There is some difficulty in getting satisfactory supplies, but there are enough to carry on for the next four months.

*Bristol.*—The carbon stock is quite satisfactory, as in accordance with the Board of Trade suggestion special economies have been introduced which will obviate any serious risk of interference with arc lighting at any rate for several months.

*Dublin.*—Alternate street arc lamps are extinguished after 11.30 p.m.

*Cardiff.*—During the past two years clusters of metal filament lamps have been substituted for nearly 700 old arc lamps, and a stock of old carbons has been offered to the Government authorities. Should they not require them, consumers with arc lamps of a similar type will have the next refusal, and the remainder will be sold at cost price to anybody else to whom they would be useful.

*Derby.*—There are about 200 street arcs and 100 shop arcs on maintenance contract. The street arcs are now trimmed daily with carbon ends, and they are changing over to 500-watt half-watt lamps on all parallel circuits. They have a fair stock of half-watt and one-watt lamps, and will continue the change over as necessity arises.

*Blackpool.*—There is sufficient stock of carbons to maintain public lighting under normal conditions for nine months, and by certain economies if necessary for twelve or eighteen months.

*Glasgow.*—Two months' supply of carbons is in stock.

*East Ham.*—Besides general economies, preparations are being made for replacing street arc lamps with ordinary metal filament lamps should the emergency arise.

*Shoreditch.*—There are sufficient stocks to go on for a considerable time.

*Islington.*—Consumers with arc lamps are being offered the short ends of carbons which have been used for street lighting, at a nominal price.

In closing this article, it may be mentioned that the position with regard to incandescent gas lighting is, if anything, more serious than that of arc-lamp lighting, as the large proportion of the gas mantles used have come from Germany, and it will probably be even more difficult to obtain gas mantles of large candle-power than it is to obtain arc-lamp carbons.

## THE WAR AND FRENCH PATENTS

WE are informed by Mr. W. H. Taylor (author of the "Inventor's and Patentee's Year-Book") that he learns from his Parisian agent that by a decree given on the 16th inst. the French Government, with commendable thoughtfulness for inventors, will allow applications for patents to be made without payment of the usual application fee of 100 francs. Such payment is only to be made after the war, and on a date to be subsequently fixed. The decree applies to British applicants, and presumably to all others except subjects of those countries at war with France.

**The British Association.**—The address of Professor E. G. Coker, President of Section G (Engineering) of the British Association, given at Sydney on last Friday, dealt with the distribution of stress in materials and modern methods of its experimental determination, including the examination by polarised light of stressed models of transparent material, a subject which Professor Coker has made particularly his own.

**The Prince of Wales's Fund.**—The General Electric Co. has contributed £500 to the Prince of Wales's Fund.—The directors of the Newcastle-upon-Tyne Electric Supply Co. and the County of Durham Electrical Power Distribution Co. have made a first contribution of £300 to be administered in the Companies' areas of supply.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

*Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.*

### QUESTION No. 1,406.

Several D.C. compound-wound, 230-volt generators, varying in size from 250 to 750 kw., run in parallel on the bus bars to supply works' load, all series windings being connected to an equaliser bus bar. There is a shortage of power, and it is desired to make use of a 1,150-kw. 460-volt compound-wound interpole generator. Could this machine be made to run in parallel on the 230-volt bus bars, and, if so, what current can be taken from it? State what alterations, if any, will have to be made.—"DOUBTFUL."

*(Replies must be received not later than first post, Sept. 3rd.)*

### ANSWERS TO No. 1,404.

What are the main requirements to be kept in view in the design of brush holders for large multipolar machines?

The first award (10s.) is made to "KOIL" for the following reply:—

The following points should receive proper consideration when designing brush holders. In addition to these there are the questions of adjustment of brush position (rocking), insulation of brush bars, and supporting of same, &c., all of which come under the heading of cross-bar rather than brush holder design. A thoroughly good brush holder should comply with the following conditions:—

(1) Rigid construction—to prevent any vibration being set up in brush-box or cross-bar.

(2) Pressure adjustment—to ensure proper contact between brush and commutator, and to enable compensation for wear to be obtained.

(3) Position adjustment—to ensure the brush bedding on the commutator at the correct angle, even when this latter has worn down to its minimum permissible diameter.

(4) Flexible copper connection to join brush and brush-box (held by a mechanical clip at each end) to prevent heating due to faulty connection between these parts.

(5) Moving parts to have low inertia—to enable the brush to follow as rapidly as possible any inequalities on the commutator periphery.

(6) Brushes as short (axially) as possible—to limit the influence of a bad part of the commutator to as small a proportion of the whole brush area as possible.

(7) Staggering of brushes—to prevent grooving of the commutator.

(8) Brushes to be removable for inspection when the machine is running.

(9) The brush holder to be removable without the others being interfered with.

(10) Brush-box to be sufficiently large to prevent the brush sticking when expanded through heat, and to ensure that the brush will not rock owing to the radial part (which envelops the brush) being too narrow.

The second award (5s.) is made to "S. N.," who writes as follows:—

The main requirements to be kept in view in the design

of brush holder for large multipolar machines may be summarised as follows:—

(1) Brushes on each brush stud to be independent, to allow for the removal of any one brush while the machine is running, the remaining brushes being of sufficient size to carry the current, while one is removed for inspection or renewal.

(2) Positive connection from the brush to the brush holder so as not to rely on the surface contact between them.

(3) A minimum width axially to the commutator to be taken up by mechanical arrangement so as to utilise, as far as possible, the whole width of the commutator.

(4) The pressure springs should exert constant pressure throughout the life of the brush, and the pressure should be easily adjustable.

(5) For the sliding brush type of holder the inside of the boxes should be smooth and straight, the brushes being a good fit to prevent chattering and movement in the box, which would prevent good bedding, and at the same time be quite free to slide.

(6) The brushes should be fed as near radially as possible: a slight rake may, however, be given in the direction of rotation, as this is found to counteract tendency to chatter.

The use of solder for the connecting lead or "pig-tail" to the brush should be avoided; either a metal clip should be used or the strands of the flexible worked into the substance of the brush during manufacture. (3) gives an argument in favour of casting all the brush holders in one piece, the space between brushes being thereby lessened; this, of course, applies to the sliding brush type, and this method of manufacture scores over stamped brush-boxes under (5), the use of modern methods of casting giving a good inside finish without further tooling. The condition of (4) is best met by helical springs, which should be as long as possible. Another point which might be mentioned is that no small or vital parts should occur at parts at which an arc-over would strike the holders; the metal here should be heavy, so that no material damage would be done in such a case; the complete holder should be as short as possible circumferentially to the commutator, in order to guard against this trouble.

## NATIONAL SERVICE

THE Institution of Electrical Engineers has received offers of service from some 1,100 members and others, in response to the circular sent out recently which was referred to in ELECTRICAL ENGINEERING, August 13th, p. 457. A circular letter is being sent to engineers of all the electric supply undertakings in the United Kingdom stating that a large number of electrical engineers have offered their services (subject to various periods of notice) to fill vacancies in connection with the public services, electric power stations, tramways, railways, &c. These names have been classified by means of index cards under various headings, and are at the disposal of supply undertakings should any of the men's services be required.

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

The next session of the University of Edinburgh commences on October 13th. The three years' courses in electrical engineering qualify for the degree of B.Sc.

Three and four year courses in electrical engineering are given at the Royal Technical College, Glasgow, which is affiliated to the University. Special instruction is given in wireless telegraphy.

The report of the Council of the City and Guilds of London Institute contains the reports and accounts relating to the work of the City and Guilds (Engineering) College, South Kensington, and of the City and Guilds Technical College, Finsbury, for the last session. In addition to statistical matter, &c., connected with the various courses, some interesting notes are given on the activities of old students.

In view of the large withdrawal of engineering students from Continental colleges and works on account of the war, the Governors of Faraday House Electrical Engineering College are willing to offer special arrangements to those who wish to join the College. They are prepared to take into consideration as far as possible the time already spent abroad, and to shorten proportionately the four years' course ordinarily required for the diploma. Students would complete their practical training in large engineering works and power stations in the United Kingdom.

The next term at the Crystal Palace School of Practical Engineering will commence on September 9th. Particulars of the course at this Institution, of which the Principal is Mr. J. W. Wilson, can be obtained from the Registrar.

## ELECTRIC TRACTION NOTES

The iron and steel industry will be able to pick up some large orders in this country on account of the war, as there are contracts for rails and tyres let to German and Belgium firms which it will not be possible to execute. One of these, for instance, is a contract for 6,000 driving-wheel tyres and 4,000 pony-wheel tyres let by the London County Council last July to Messrs. John Batt & Co., who are agents for the Vereinigte Stahlwerke van der Zypen und Wissener Eisenhütten A.G. of Cologne. The contract has not been cancelled, and we understand that Messrs. Batt & Co. are endeavouring to find a British firm to take it over as sub-contractors. Meantime, however, the L.C.C. have ordered the same quantity of tyres, which represents a six months' supply, from Messrs. H. Bessemer & Co., whose tender in July had been the next lowest.

It is anticipated that it will be possible to inaugurate "through" electric train services between the Elephant & Castle and Watford by the end of this year. This will be the first portion of the intercommunication scheme with the London underground railways made possible by the electrification of the London & North-Western suburban lines.

It has been decided to cancel all arrangements for the Annual Conference of the Municipal Tramways Association, which was to have been held at Salford in September. The Council felt it inadvisable to hold the Conference in the present circumstances.

Among the Papers read before the Engineering Section at the British Association meeting in Australia was one on "Railways and Motive Power," by Prof. W. E. Dalby, F.R.S. Various curves relating to the development and cost of working of English railways were shown. The question of motive-power was considered and the advantages of the locomotive and the electric motor compared. Curves were also shown illustrating the proportion of fuel actually used to draw a train, as compared with the quantity fired in the furnace of a steam locomotive and in the furnace of a central station in the case of electric traction. Other curves illustrated the limits of economy and speed of a steam locomotive and the electric motor compared together in relation to special problems in connection with suburban traffic.

The Directors of the Oldham, Ashton & Hyde Electric Tramways, Ltd., have decided to postpone the interim dividend on the ordinary shares, owing to the war. In ordinary circumstances it would have been paid on August 15th.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The Italian Administration states that plain English is now authorised for telegrams or radio-telegrams for Consular agents.—The Argentine Republic has suspended telegrams in code. This does not apply to Government and Consular telegrams.—The cable between the French Penal Settlement of New Caledonia and Australia was interrupted on the 20th inst.—Since the 21st inst. communication with Brussels has been entirely cut off, and telegrams cannot be accepted for the Provinces Limburg, Liège, Namur, Luxemburg, Brabant, or Antwerp, excepting the town of Antwerp.—The Egyptian Administration only now accepts terminal and transit telegrams at senders' risk. They must be in plain English, French, Arabic, or Turkish, fully addressed and signed.—The Japanese Government notify following restrictions on terminal and transit telegrams: Private telegrams originating in Japan must be in plain Japanese, English, or French; but code telegrams are accepted at Tokio, Yokohama, Osaka, Kobe, Nagoya, Yokkaichi, Simoneseki, Nagasaki, Moji, Sapporo, Hakodate, and Otaxu under certain restrictions..

Telegrams for Ghent may be accepted.—The cable between Tokio and the Bonin Islands was repaired on the 23rd inst.—The Belgian Army, it is believed, blew up the wireless station at Laeken before evacuating Brussels.—The Shanghai-Nagasaki cable is reported to be down, and the wireless station at Tuckerton closed by the American Government.

Among the Papers read before the Engineering Section of the British Association in Australia was one on "The Capacity of Radio-Telegraphic Aerials," by Professor G. W. O. Howe. The capacity considered in this Paper is the actual static

capacity, and not the equivalent capacity of the antenna considered as part of an oscillatory circuit. The accurate calculation of the capacity of a multiple-wire horizontal aerial with its leading-down wires would be a difficult mathematical problem, quite unwarranted by the practical requirements of radio-telegraphy. When raised to a potential above or below that of the earth, the charge is distributed over the antenna in a way which is not easy to calculate, but which must be such that all parts of the antenna are at the same potential. If the antenna were made up of a great number of short pieces, placed end to end, but insulated from each other, it would be possible to distribute the charge uniformly, but the potential would then vary from point to point in a way which is easily calculated. If now we assume that all the separate pieces of wire are connected, electricity will flow from points of high to points of low potential until the potential is everywhere the same. The assumption made in developing the various formulæ is that this final uniform potential is equal to the average value of the potential when the charge was uniformly distributed. This is only approximately correct, but the accuracy is more than sufficient for all practical purposes. This method has been applied to antennæ of all the types usually employed, and formulæ have been established for each type. A large number of numerical examples have been worked out, and the results are given in tables and curves, so that the capacity of any antenna can be read off directly from its dimensions. The corrections due to the leading-down wires and to the proximity of the earth are fully considered, and examples given showing the application of the formulæ to antennæ of any type.

An interim report of the Committee on Radio-telegraphic Investigations was submitted to Section A, dealing with the arrangements made for the collection of statistics and the proposed observations during the solar eclipse. This work was of course, entirely suspended owing to the war.

Three wireless telegraph stations are being erected in Hudson Bay and the Straits to facilitate shipping. These will provide a continuous line of communication with the Atlantic.

A new wireless station is being erected by the Canadian Government at Cape Race, with a radius of 500 miles.

During a recent voyage of the Canadian Northern R.M.S. *Royal George* interesting tests were made of the Marconi-Bellini-Tosi wireless compass, the installation of which we have already announced. The instrument is stated to have been accurate within one degree in determining the compass direction both of shore stations and stations on other vessels. They had, for instance, been able to ascertain the compass position of Cape Race, Cape Ray, Father Point, and verified wireless signal direction from the s.s. *Columbia*, the s.s. *Calgarian*, and the s.s. *Sicilian*. The *Columbia* was sixty-eight miles distant, the *Sicilian* eighteen, and the *Calgarian* fifty-three. The fact that there was fog at Cape Race made no difference, and Capt. Thompson, the Commander, believes there are great possibilities for the system, especially in the event of going to the rescue of a ship sending out the S.O.S. call.

A new transmitting apparatus for wireless telephony, due to Herr L. Kühn, and developed by the Gesellschaft für drahtlose Telegraphie, was recently described in a German paper. The microphone current is passed through a winding over a soft iron core, on which is wound a second winding connected in the antennæ circuit. The self-induction of the latter coil varies according to the fluctuations in the microphone circuit, and the oscillations in the antennæ circuit therefore also vary in frequency accordingly. By this means, it is stated, an oscillation energy of 8 kw. in the antennæ circuit has been sufficiently influenced by a microphone energy of only 8.7 watts to effect a proper transmission of speech.

**High Voltages in Military Defence.**—The *Times* correspondent reports that barbed wire entanglements made live with a pressure of 1,500 volts formed part of the defences of Namur.

**The Shipping, Engineering, and Machinery Exhibition.**—It is formally announced that this exhibition, which was to have started on September 25th at Olympia, is to be postponed to some time between July and September, 1915.

**Theft at Foster Engineering Co.'s Works.**—An extraordinary case was heard last week at the Wimbledon Police Court, when George Kertland, of Shepherd's Bush, was charged with being concerned with two other men not in custody with stealing carbons and other goods value £2,000 from the works of the Foster Engineering Co. Most of the goods were found at an engineering works at Hayes, Middlesex. The prisoner alleged that he had the authority of the Treasury for his act, as the goods were "the property of an alien enemy." Any suggestion of the kind, however, is strongly repudiated by the Foster Engineering Co.



## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published August 20th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad

17,038/13. **Telephone Systems.** K. E. ERICSSON and J. DAHLSTRÖM. An improved relay system in which each of the stations which are to communicate with each other is connected to its own relay apparatus at a relay station. Each pair of lines entering the relay station is adapted to be connected either to the primary of a microphonic intensifying circuit or to the secondary winding of a transformer. When the subscriber at one station begins speaking, the magnified current produced in the microphone circuit operates a time relay switch through a transformer, thus disconnecting the outgoing line of the receiving station from its microphone circuit, so that no disturbing sounds are produced. When the speaking ceases, the switch comes back to the normal position after a short interval, and when the other subscriber commences to speak, the lines from the first station are in their turn disconnected from the microphone circuit. Five figures.

17,859/13. **Wireless Signalling.** R. C. GALLETTI. The specification describes an improved method of signalling by the use of unidirectional cyclic discharges (see ELECTRICAL ENGINEERING, May 29th, 1913, p. 310). Two sets of cyclic discharge circuits are used, one for sending the Morse signals and the other to take up energy during the intervals between the signals. This prevents arcing or sparking at the operating key, and enables heavy currents to be utilised. Two figures.

26,764/13. **Conduit Fittings.** J. R. A. HEMMING. The conduit is held in the socket by a transverse gripping screw in a lug at the side. In casting, the internal diameter of the socket is left small so that the transverse hole in the lug can be tapped without breaking through. The screw is then screwed into place, and the socket is bored out to the correct diameter, part of the screw being cut away in the process. The conduit can then be inserted, and is firmly gripped by giving the screw a quarter turn. Five figures.

8,711/13. **Starting Rotary Converters.** SIEMENS BROS. DYN. WKS., LTD. (*Siemens-Schuckert. Ges.*). When rotary converters are started up from the A.C. side, the polarity at the moment the machine comes to synchronism is a matter of chance, so that a reversing switch has to be provided in the field circuit. This invention ensures correct polarity by the use of an electrical valve in the exciting circuit, which valve only allows current to flow in one direction. It may consist of an iron-aluminium cell, and is connected in series with a regulating resistance and the field winding of the converter. A high resistance should be arranged in parallel with the cell to guard against an excess of pressure. One figure.

### Specifications Published To-Day

The following Patent Specifications will be published to day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** CONRADTY [Carbons] 22,223/13; WEINTRAUB [Vapour lamps] 6,352/14.

**Distributing Systems, Cables, Wires, and Insulating Material:** RUMOLINO [Control of marine engines] 26,733/13; COLD LIGHT (DUSSAND PROCESSES), LTD. [Lighting] 27,148/13; DOULTON and MORRIS [Troughs for cables] 27,409/13; ETILLE [Connection for relays] 7,201/14.

**Electrometallurgy and Electrochemistry:** CRAFTS [Furnaces] 18,072/13; HEUSER [Welding] 597/14.

**Ignition:** ROGALSKI [Interrupter] 26,338/13.

**Incandescent Lamps:** DICKER [Safety lamps] 5,088/13; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Lamps] 18,447/13; SCHAEFER [Lamp supports] 8,807/14.

**Instruments and Meters:** ONWOOD [Voltmeters and ammeters] 17,733/13; ROGOWSKI [Magnetic potential meter] 18,103/13; SZILARD [Electrometers] 20,008/13.

**Storage Batteries, &c.: BURGER [Galvanic cell] 15,463/13; THOMPSON [Unspillable accumulators] 20,216/13; HAMILTON [Pocket lamp batteries] 14,686/14.**

**Switchgear, Fuses, and Fittings:** AKT.-GES. BROWN, BOVERI ET CIE. [Liquid resistances] 18,000/13; SCHALCH [Contact device for lifts] 18,479/13; MERRILL [Regulators] 3,149/14; SIEMENS-SCHUCKERT. GES. [Circuit breakers] 10,082/14.

**Telephony and Telegraphy:** WESTERN ELECT. CO. (*Woodward*) [Telephone exchange system] 18,122/13; UNITED TELEGRAPH & CABLE CO. and BRUCE [Telegraphy] 18,321/13; MARCONI'S WIRE-

LESS TELEGRAPH CO. and ROUND [Wireless receivers] 18,326/13; MCGAURAN [Telephone call-recorders] 19,220/13; SIEMENS & HALSKE A.-K. [Telephone system] 19,271/13; CAMERON [Automatic telegraph systems] 20,773/13; LAVERY and BANDLOW [Telephone system] 4,619/14; CIE. FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON [Telephone instruments] 5,640/14; RYAN and EASTERN TELEGRAPH CO. [Duplex telegraphy] 10,794/14.

**Traction:** KODDERITZSCH [Retrieving device for trolley collectors] 19,475/13; BOIRAULT [Connection devices for vehicles] 21,480/13.

**Miscellaneous:** READ and BRANSOM [Electrically controlled valve] 17,926/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distributing Systems, Cables, Wires and Insulating Material:** STORER [Motor control systems] 17,465/14.

**Electrometallurgy and Electrochemistry:** SIEMENS & HALSKE A.-K. [Electrolysis of halogen alkalis] 17,089/14.

**Incandescent Lamps:** SEIFERT [Manufacture of tungsten wire] 9,874/14.

**Switchgear, Fuses and Fittings:** SIEMENS-SCHUCKERT. GES. [Starting switches] 17,949/14.

**Telephony and Telegraphy:** BOUCHARDON [Hertzian wave apparatus] 18,009/14; BLESSING [Telephone systems] 18,033/14; BETULANDER [Selectors] 18,076/14.

**Miscellaneous:** KIENZLE [Machine tools] 18,042/14; SIEMENS-SCHUCKERT. GES. [Signalling arrangements for searchlights] 18,125/14.

### Opposition to Grant of Patents

19,963/12. **Improved Magneto.** O. BÄRTSCH. The Comptroller has decided to allow the grant of this Patent.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** O. SCHAEFER [Lamp support] 9,510/08.

**Dynamos, Motors and Transformers:** E. A. CAROLAN (*G.E. Co., U.S.A.*) [Control of vapour rectifiers] 10,341/04; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Field windings for A.C. commutator motors] 10,457/04.

**Electrochemistry and Electrometallurgy:** A. CLEMM [Manufacture of phosphates] 9,443/05; A. HIORTH [Induction furnace] 28,959/06.

**Incandescent Lamps:** A. C. HYDE [Sealing-in wires for bulbs] 10,472/06.

**Traction:** P. BROWNE [Signalling system] 10,560/07.

**Miscellaneous:** ARMSTRONG WHITWORTH & Co. and E. W. LLOYD [Lamp signalling apparatus] 9,194/01.

### PROCEDURE TO OBTAIN SUSPENSION OF BRITISH PATENTS GRANTED TO GERMANS AND AUSTRIANS

ON August 7th a short Act of Parliament was passed authorising the Board of Trade to make regulations for avoiding or suspending any patent granted to the subject of a State at war with this country. The Act, and the regulation which has now been issued, are to be in force during the war and for a subsequent period of six months. It is open to anybody to apply for the suspension of any such patent, but the applicant must first satisfy the Board of Trade that the applicant "intends to manufacture, or cause to be manufactured, the patented article, or to carry on or cause to be carried on, the patented process," and also that it is to the interests of this country or to a particular trade that the application should be granted. All such applications will be the subject of special inquiries by a person or persons appointed by the Board, and it rests entirely with the discretion of the Board whether such applications will be granted or not, in every case.

The regulations also provide for an extension of time for proceedings under the Patents and Designs Act, 1907, and the Trade Marks Act, 1905, where the person concerned is on active service, or is prevented in any way owing to the war from continuing the proceedings meanwhile, or where the continuation of the proceedings would be prejudicial to the person concerned.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**HEATERS.**—A new leaflet to hand from Ferranti, Ltd. (Kingsway, W.C.), describes their 1914 type of electric fires. Spare elements are also kept in stock, so that renewals can easily be effected. Each fire is fitted with two elements and two switches, thus allowing two heats to be obtained.

**HEATING AND COOKING APPARATUS.**—A series of leaflets has been issued by Belling & Co. (Edmonton), and which can be obtained by application to the above address, gives the revised and reduced prices of their well-known types of electric heating and cooking apparatus, including boiling rings, grillers, the "Belling" griller-oven, and the "Office," "Portable," and "Standard" patterns of fires. The fact that all "Belling" fires are guaranteed for three years' severe service should suffice to indicate the excellence of their manufacture, and it is important to notice that these fires, like all "Belling" goods, are entirely British made. As the demand for domestic labour-saving appliances is sure to be augmented in the near future, we have no doubt that the Company's enterprising and patriotic policy will meet with the success it deserves.

**INSULATING VARNISHES.**—A leaflet from Chas. H. Blume (White Building, Sheffield) gives particulars of the several brands of the well-known "Megomac" and "Insulac" varnishes, which are manufactured in seven different grades to meet the requirements of a large variety of general work. The qualities of these varnishes can also be adjusted to suit any special service conditions which may arise.

### WATER-TIGHT FITTINGS AND SWITCHES

THE illustration reproduced herewith shows a chain-pull switch-box, designed for use in conjunction with "Simplex" watertight fittings. It consists of a watertight switch-box, the switch being operated by a rocker arm attached to a spindle which passes through a gland in the box cover. Simplex Conduits, Ltd. (Garrison Lane, Birmingham), in addition to the above switch, have also a similar pattern which is operated by turning a knob on the top of the box cover. On account of the objection which many engineers have to tube-end bushes made of wood or insulating material, the Company are introducing brass and lead bushes for this purpose.



CHAIN-PULL SWITCH.

### ROYAL EDISWAN LAMPS

WE give in the accompanying illustrations views of the glass works of the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex), which is one of the two lamp manufacturers in this country who have their own glass houses. All glass is made and blown in these works for the various bulbs used in the many sizes and types of Royal Ediswan lamps. Fig. 1 shows a part of the interior of one of the glass houses where experienced glass-blowers are seen at work. One of the operatives can be seen at the furnace gathering "metal," and two other operatives are seen blowing and finishing the bulbs off in the mould. This class of work is skilled, and requires a great deal of experience and careful handling. The glass houses are kept continuously running, the operatives working in three eight-hour shifts each. Considerable extensions to the existing Ediswan glass houses are being made to meet the increased business which is being negotiated on every hand for an All-British lamp. Fig. 2 gives an idea of the peculiar shape of the buildings, at the rear of which may be seen a series of storage rooms containing millions of Royal Ediswan bulbs ready for making into lamps.

The staff of the lamp manufacturing section is also being added to daily owing to the increased orders, and the engineer-

ing section of the works is likewise in a state of increased activity caused by Admiralty work. It may be noted here that the firm is paying the wives of married employees serving in the Army half pay, and will allow the men to take up their old positions upon return.

The Company are sending out a circular letter pointing out that owing to the advances in the prices of raw materials, withdrawal of their existing price lists is liable at any moment,

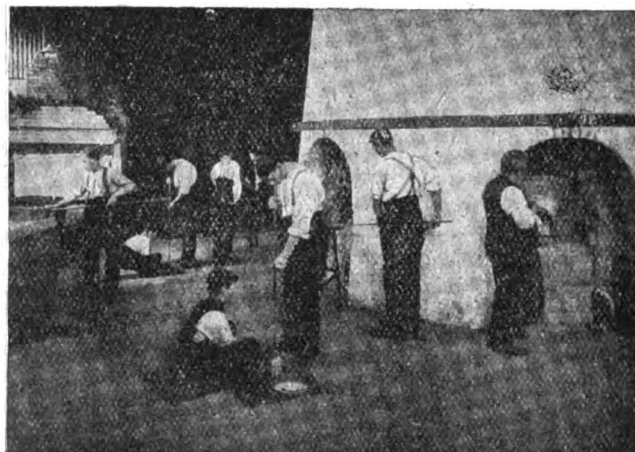


FIG. 1.—INTERIOR OF EDISWAN GLASS HOUSE.

although they do not propose to make any drastic alterations at present. Owing to their satisfactory position, however, with regard to stocks, they are able to fulfil all general requirements, and as regards stock of lamps their position is particularly favourable. The Company is showing great activity in the advertising line, and has just produced two very effective new showcards, one dealing with lamps and the other with All-

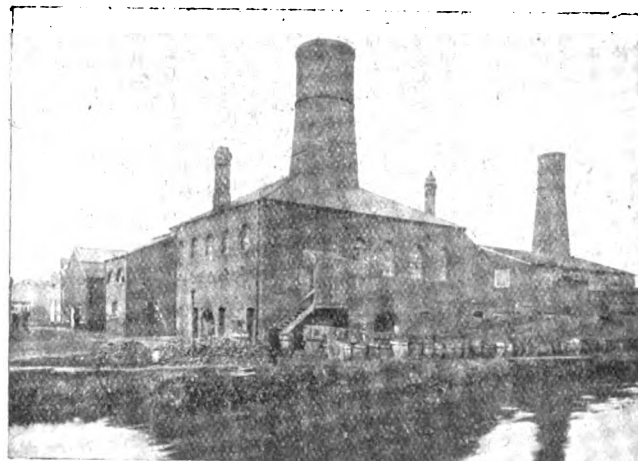


FIG. 2.—EXTERIOR OF EDISWAN GLASS WORKS.

British Ediswan fans. Another circular letter reminds the company's friends that Royal Ediswan lamps have been made with British capital as well as British labour ever since 1883.

The increase in the demand for radiator lamps has enabled the Company to reduce the list prices of these to 3s. 3d. for all voltages, and in connection with other types of radiators, it is interesting to note that they are supplying a quantity of Admiralty pattern Quartzalite radiators to H.M.S. *Tiger* being built by John Brown & Co., Clydebank.

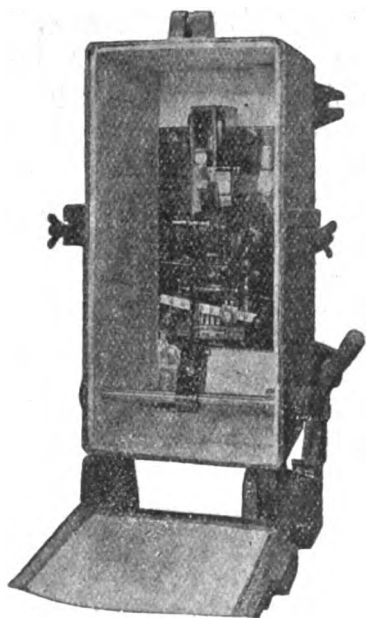
**The Strength of Metal Filament Lamps.**—During the severe thunderstorm which passed over Dublin district recently, the overhead wires of the Dublin and Lucan Electric Railway were struck by lightning. The glass support of one of the Royal Ediswan "Downlite" lamps was fused, but on examination the filament was found to be intact. This is a good illustration of the wonderful strength of these filaments. The actual lamp is on show at the Dublin depot of the Edison & Swan United Electric Light Co., Ltd.

### MAZDA DRAWN WIRE LAMPS

WE called attention three years ago (see ELECTRICAL ENGINEERING, Vol. VII., p. 467, August 24th, 1911) to the announcement of the application of drawn-wire filaments to Mazda lamps, and the British Thomson-Houston Co. now remind us that from the very inception of the drawn-wire process all the wire used in Mazda lamps has been manufactured in Rugby. The wisdom of the Company in this course is more than ever evident in the present crisis, for they inform us that they are now absolutely independent of any other country for the supply of tungsten wire. This fact places them in a certain and safe position, and also assures the advantage to the trade and public of a continuity of supply. It will also be remembered that the introduction of half-watt lamps was first announced in Great Britain at Mazda House on August 26th last year, and we there saw samples of the first Rugby-made half-watt Mazda lamp. Ever since that time the British Thomson-Houston Co. have been busily engaged on the manufacture of these lamps, and it was with a feeling of satisfaction that we published the announcement last week that British-made half-watt lamps are now being produced in commercial quantities at Rugby. The British Thomson-Houston Co., Ltd., is thus in the satisfactory position of being able to guarantee that all its lamps—Mazda and carbon—of every type and size are made in Great Britain by British workpeople.

### ENCLOSED CIRCUIT BREAKERS

IN industrial work it is eminently desirable that circuit-breakers and other electrical gear shall, wherever possible, be totally enclosed. Amongst the apparatus which it is more difficult to enclose totally are circuit-breakers, but the General Electric Co., Ltd. (Witton, Birmingham, and 67 Queen Victoria Street, London, E.C.), have recently introduced a new design



"SALFORD" ENCLOSED  
CIRCUIT-BREAKER.

which is shown in the accompanying illustration. The circuit-breaker is fixed in a strong cast-iron case intended for mounting on a wall or angle iron framework. The lid is hinged and is interlocked with the switch. An important feature is the fact that the breaker can be opened and closed with the same handle—a great improvement over the use of a special lever for tripping.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—The Victorian Railway Commissioners require low-tension switchgear and instruments, low-tension cable, and fuse-boxes and fuses. Further particulars at Board of Trade Intelligence Department, 73 Basinghall, St., E.C.

**Bradford.**—Electric lighting of Guardians Buildings at

Clayton (including generating plant). Clerk to the Guardians, August 28th.

**Chile.**—A generating station is to be erected at Cartagena by Don Francisco Soto. The plans have been approved by the authorities.

**Colwyn Bay.**—The proposed new power station is to be put in hand at once, in order to provide employment.

**Irlam.**—The Electric Lighting Sub-Committee recommends the employment of an expert to prepare an electric lighting scheme.

**Liverpool.**—An expenditure of £40,000 upon mains is to be incurred.

**London: St. Pancras.**—In order to assist in preventing unemployment it is recommended that extensions to the power station be put in hand. Additional mains are also to be laid.

**L.C.C.**—Induced-draught fans, motors, spare parts, and dampers at Greenwich power station. Clerk. September 22nd. (See an advertisement on another page.)

**Wimbledon.**—A Local Government Board inquiry was held last week concerning the loan of £8,500 for the purpose of laying two extra high-pressure cables throughout certain parts of the district, and also for the provision of a transformer sub-station. At present the mains serving the Merton and Maldens and Coombe district are 15 per cent. overloaded.

#### Wiring

**Huddersfield.**—Electric lighting, bells, telephones, &c., at Storther Hall Asylum. Engineer, West Riding Asylum, Wakefield. September 9th.

**Loughrea.**—The Loughrea Electric Lighting & Power Co. invites tenders for wiring consumers' premises. Secretary.

**Torpoint.**—Electric lighting fittings for Council offices. Borough Engineer. September 3rd.

**Warrington.**—Wiring of Evelyn Street Council School. Secretary, Education Committee.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bury.**—Rebuilding mill for Bury Felt Mfg. Co.

**Eastbourne.**—236 houses. £60,000. Town Clerk.

**Edinburgh.**—Post Office Stores, Roseburn. H.M. Office of Works, London.

**Hull.**—Sanatorium. £14,500.

**Stratford.**—New packing warehouse. C. W. S., Ltd., Manchester.

#### Miscellaneous

**Australia.**—The Deputy Postmaster-General requires telephone instruments and switchboard parts. Further particulars at Board of Trade Intelligence Department, 73 Basinghall Street, E.C.

**Leeds.**—Four sections of tramway track. General Manager, September 7th.

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Basingstoke.**—The tender of Messrs. Leader & Co. has been accepted at £78 for wiring the generating station, and that of Messrs. Milsom & Co., at £77, for wiring the Town Hall.

**London: H.M. Office of Works.**—A contract for a twelve months' supply of Wotan drawn-wire tungsten lamps has been placed with Messrs. Siemens Bros. Dynamo Works, Ltd.

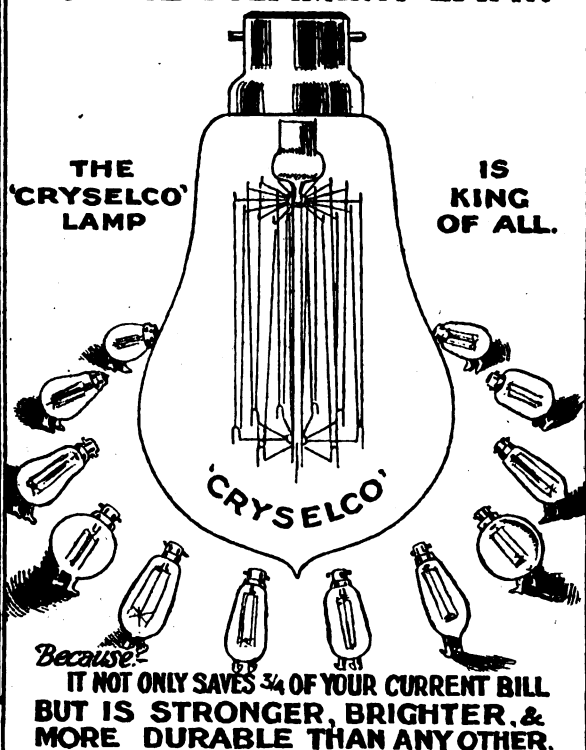
**L.C.C.**—A contract has been placed with Messrs. Siemens Bros. Dynamo Works, Ltd., for 125,000 Tantalum traction lamps. These lamps, we understand, have been used for the past two years on practically the whole of the L.C.C. tramways.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**British Made Woodwork.**—C. Jennings & Co., 955 Pennywell Road, Brixton, inform us that works are running as usual, and their various depôts are open to supply timber and woodwork of every description.

**J. H. Tucker & Co.**—This firm, who have for twenty years manufactured nothing but all-British goods, inform us that

# ALL OTHERS BOW BEFORE *The* **CRYSELCO** METAL FILAMENT LAMP.



## PHENIX ASSURANCE COMPANY, LIMITED. ESTABLISHED 1782.

Head Offices: 19 & 70, LOMBARD STREET, LONDON, E.C.

TOTAL FUNDS EXCEED	CLAIMS PAID EXCEED
<b>£16,000,000</b>	<b>£90,000,000</b>

CHAIRMAN: RT. HON. LORD GEORGE HAMILTON, P.C., G.C.S.I.

### FIRE - LIFE - ACCIDENT - MARINE

Loss of Profits following Fire, Workmen's Compensation, Fidelity Guarantee, Burglary, Trustee and Executor, &c.

#### ELECTRIC LIGHTING.

The Company has always encouraged the development of Electricity, and the well-known "Phoenix Fire Office" Rules for Electrical Installations are in use throughout the world. Copies will be supplied free on application to Head Offices.

General Manager: SIR GERALD H. RYAN.



**Ladders, Steps, Trestles, Scaffolds, &c.**

Sale or Hire.

**HEATHMAN & CO.**

10, Parson's Green, London, S.W.

HEATHMAN'S PLAIN DECORATOR'S TRESTLES. MADE IN TWO WIDTHS. NEW TOP TO TAKE ONE SCAFFOLD BOARD. NEW TOP TO TAKE TWO SCAFFOLD BOARDS. "FOR SALE OR HIRE"



**MARRYAT & PLACE**

DYNAMO & MOTOR HOSPITAL.

25, MATTON GATE, LONDON, E.C.

with the exception of certain raw material, they are practically independent of outside sources of supply, and are carrying on as usual, in addition to their well-known tumbler switches and accessories, the manufacture of a complete range of switch- and fuse-boards, &c.

**Ebonite.**—Mr. J. Martin Blair (53 New Broad Street, E.C.) has been appointed the London representative of an English firm of ebonite and vulcanite manufacturers, and will be pleased to have inquiries for rod, sheet, and tube, also battery boxes, telephone fittings, and turned and moulded goods. Mr. Blair also represents the Record Engineering Co., Ltd. (Manchester), for petrol, paraffin, and gas engines, and Broom & Wade, Ltd. (High Wycombe), for air compressors and hoists.

### LOCAL NOTES

**Chertsey: Electric Supply.**—The Rural District Council has informed the Ascot District Electricity Supply Co.—which has statutory powers in the district—that unless a supply is given at an early date, permission will be given to the Woking Electric Supply Co., who has offered a supply.

**Clones: Electric Lighting Postponed.**—Owing to the war, the Council has decided to defer further action regarding the electric lighting scheme for six months.

**South Shields: Hiring and Wiring Powers.**—There was a record profit of £3,484 upon the working of the Electricity Undertaking last year, after meeting expenditure amounting to over £1,000 upon such items as meters, equipment of office and showrooms, connecting new consumers, &c. Mr. H. S. Ellis, the Borough Electrical Engineer, is highly satisfied with the effect upon the undertaking of the new showrooms, all goods being sold, however, through contractors. The domestic heating and power units increased last year by 68 per cent. Attention is called to the handicap upon the undertaking by not possessing hiring and wiring powers, but in the absence of such powers it is recommended that a canvasser should be appointed in order to develop the business as much as possible. The Committee is also urged to facilitate the organisation of an up-to-date publicity department.

**Tasmania: State Purchase of Electric Power Co.**—A proposal for the purchase of the Hydro-Electric Power Co.'s undertaking is to be placed before the Government.

**Wallasey: The Diesel Engine Contract.**—A friendly arrangement has been come to between the Corporation and Messrs. Mirrlees, Bickerton & Day to put an end to the contract of April, 1912, for a Diesel engine driven alternator. The Company will take back the Diesel engine and the Corporation will retain the alternator at the price of £948. Since the contract was entered into, conditions have changed considerably, and the Corporation has embarked upon a large new steam-driven station.

### APPOINTMENTS AND PERSONAL NOTES

A borough electrical engineer is required at Swansea. Salary £500 per annum. Applications to Town Clerk by September 15th. (See an advertisement on another page.)

The South Indian Railway Co. requires the services of a fully qualified electrical engineer. Applications to Mr. Robert White, Consulting Engineer to the Company, 3 Victoria Street, S.W. (See advertisement on another page.)

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Newcastle & District Electric Lighting Co.**—An interim dividend at the rate of 3 per cent. per annum is announced.

**National Electric Construction Co.**—The proposal to reduce the capital to the extent of ten shillings per share, mentioned on p. 450 of our issue for August 13th, was sanctioned last week. At the ordinary meeting which preceded the special meeting it was stated that the war has interrupted negotiations for an important electric railway on the Continent. Estimates are being prepared in Baghdad for electric lighting and tramway undertakings there.



# TRADES DIRECTORY OF ADVERTISERS IN "ELECTRICAL ENGINEERING."

(One Free Entry is given to every Advertiser. Entries under additional headings, 6d. per insertion.)

## ACCESSORIES (Electric Light and General Supplies).

Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Edison & Swan United Electric Light Co., Ltd., Ponders End, Middlesex.  
Electrical Co., Ltd., 122 to 124, Charing Cross Rd., W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Gullfert-Martin, 9, Edmund Place, E.C.  
Haslam & Schonheill, Ltd., 11, Windsor Place, Cardiff.  
Jandberg (A. F.) & Sons, Liverpool Rd., N.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., W.C.  
Rus Electrical Co., Ltd., 118, Charing Cross Road, W.C.  
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Wardle Engineering Co., Ltd., 196, Deansgate, Manchester.

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Hart Accumulator Co., Ltd., Marshgate Lane, Stratford.  
Naylor Battery Co., 1, Lammernoor Rd., Balham, S.W.  
Vudor Accumulator Co., Ltd., 8, Central Buildings, Matthew Parker St., S.W.  
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London Electric Firm, Croydon.  
Oliver Arc Lamp Ltd., Cambridge Place, Burrage Rd., Woolwich.

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Heeper's Telegraph & Indiarubber Works, Millwall Docks, E.  
Key Engineering Co., Ltd., 4, Queen Victoria St., E.C.  
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Belling & Co., Lancaster Works, Derby Road, Edmonton, N.  
British Prometheus Co., Ltd., Salop St. Works, Highgate, Birmingham.  
British Thomson-Houston Co., Ltd., Rugby.  
Brompton & Kensington Accessories Co., Ltd., 254 to 260 Earls Court Road, S.W.  
Downing Radiant Heat Co., Ltd., 105, Great Portland St., W.  
Drake & Gorham, Ltd., 66, Victoria St., S.W.  
Ferranti, Ltd., Central House, Kingsway, W.C.  
General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
London Electrical Trading Co., Ltd., 185, Wardour St., W.C.  
Premier Electric Heaters, Ltd., 258 to 260, Bradford St., Birmingham.  
Simplex Conduits, Ltd., 118 to 117, Charing Cross Rd., E.C.  
Townshend's Art Metal Co., Ltd., Ernest St., Birmingham.

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Ferranti Ltd., Central House, Kingsway, W.C.  
Kelvin, Bottomley & Baird, Ltd., 18, Cambridge St., Glasgow.  
Nalder Bros. & Thompson, Ltd., 97a, Dalston Lane Dalston, N.E.  
Record Electrical Co., Ltd., Caxton House, Westminster, S.W.  
Weston Electrical Instrument Co., Audrey House, Ely Place, E.C.

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Fredk. Crane Chemical Co., Armoury Close, Bordesley Green, Birmingham.  
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Northern Varnish Co., Allerton, Bradford.  
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General Electric Co., Ltd., 67, Queen Victoria St., E.C.  
Pope's Electric Lamp Co., Ltd., Hythe Road, Willenden, N.W.  
Siemens Bros. Dynamo Works, Ltd., Tyssen St., Dalston, N.E.  
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Castian Meter Co., Ltd., Kentish Town, N.W.  
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Chamberlain & Hookham, Ltd., Solar Works New Bartholomew St., Birmingham.  
Ferranti, Ltd., Central House, Kingsway, W.C.

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Matthews & Yates, Ltd., Swinton, Manchester.  
Peabie (Bruce) & Co., Ltd., Edinburgh.  
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Vickers, Ltd., River Don Works, Sheffield.  
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Ferranti Ltd., Central House, Kingsway, W.C.  
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Cambridge University Press, Fetter Lane, E.C.  
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Macmillan & Co., Ltd., St. Martin's St., W.C.  
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Graham (Alfred) & Co., St. Andrew's Works, Crofton Park, London, S.E.  
Siemens Bros. & Co., Ltd., Woolwich.  
Western Electric Co., Ltd., North Woolwich, E.

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Smit Transformer Co., Queen Anne's Chambers, Westminster, S.W.

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Kennicott Water Softener Co., Ltd., Wolverhampton.

## WIRING CONTRACTORS. See page iv.

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## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Published on the First Thursday of each month

### EXHAUST STEAM PLANT AT A COVENTRY COLLIERY

AN example of modern method of electrical working in a colliery is to be found in the Coventry colliery of the Warwickshire Coal Co., where sinking operations are at present proceeding. One of the first steps in this scheme was the establishment of a large electric power-house with sufficient plant to afford an adequate supply of electric power for sinking, and with ample space for future extensions. In this colliery steam winding engines have been installed, and their exhaust is utilised in mixed pressure turbo-generators. There are two shafts 21 ft. 6 in. diameter and 180 ft. apart, with an approximate depth of 730 yds. A large brick building runs parallel to the line joining the centres of the shafts. The winding engines are installed one at each end, and the centre portion is allotted to the power-house. The boiler-house is a short distance away and contains a bank of six hand-fired Lancashire boilers. The exhaust steam from the winding engines passes through a Rateau-Morrison steam accumulator, which is of sufficient capacity to bridge over a stoppage of half a minute. In addition, there is a connection direct from the boilers to the mixed-pressure turbines, by

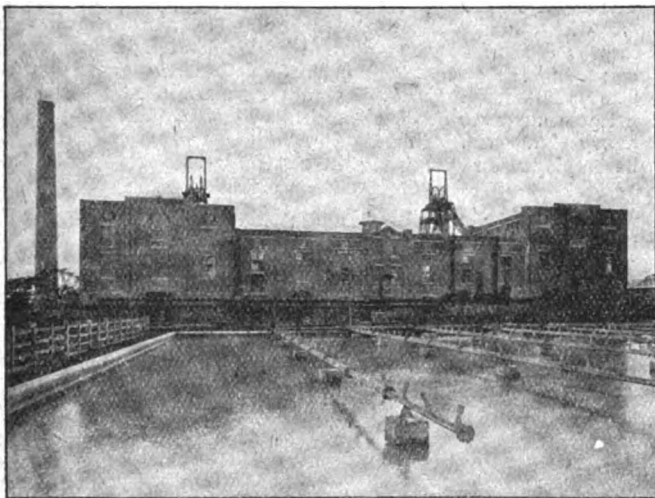


FIG. 1.—POWER HOUSE WITH COOLING POND IN FOREGROUND.

which the turbines can draw live steam when required. The condensing water is cooled in a cooling pond by the spray method. It is anticipated that with coal winding in full swing the engines will afford an average supply of 50,000 lb. of steam per hour at a pressure of 2 lb. per sq. in. absolute to the turbines, sufficient to generate 1,250 kw. continuously. The present generating plant consists of two 880 k.v.a. "Witton" turbo-alternators driven by the mixed-pressure turbines at a speed of 3,000 r.p.m. Three-phase power is generated at a pressure of 2,750 volts 50 cycles. The exciters for the turbines are direct-coupled, as shown in the view of the engine-room. A third and similar set will probably be installed. The air-pumps and other auxiliaries are steam-driven, with the exception of two centrifugal pumps giving a supply of 240 gallons of water per minute against a total head of 39 ft. These pumps are driven by 7.5 h.p. "Witton" motors. They are used for supplying water to cool the oil which lubricates the bearings of the turbines and for emptying the cooling pond. For lighting purposes there has been installed a 55-kw. "Witton" generator driven by a high-speed steam engine at 575 r.p.m. This gives a three-wire continuous-current supply at 230 volts across the outers, a static balancer giving the necessary neutral connection. The set is only used when the winding engines are not at work. When exhaust steam is available lighting current is taken from the main alternating-current supply, and the conversion from alternating to continuous current is effected by a 55-kw. "Witton" motor-generator running at 580 r.p.m. The rotor starter for this set is situated close to the machine. As with

the steam-driven lighting generator, the third wire connection is attained by a "Witton" static balancer, and acts as a stand-by exciter for the turbo-generator. The generators have been designed with high internal reactance in order to enable them to withstand heavy short-circuits without damage to the windings. Close regulation is obtained by means of a Brown, Boveri voltage regulator. The colliery works with an insulated neutral. The electrical plant was supplied by the

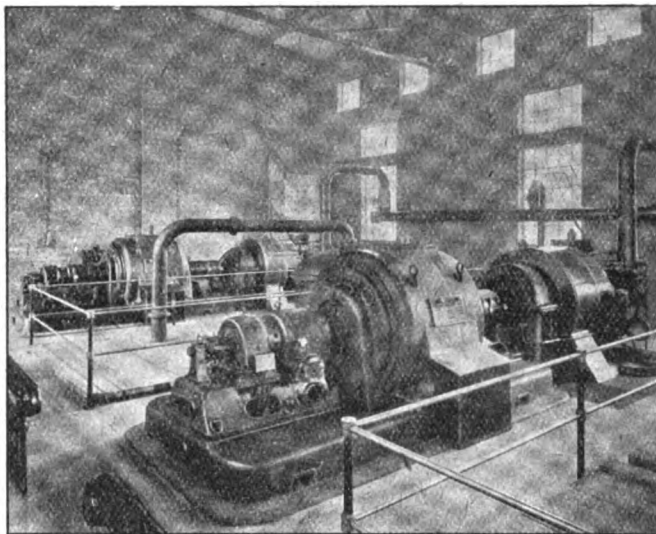


FIG. 2.—MIXED PRESSURE TURBO-GENERATORS.

General Electric Co., Ltd. (Witton, Birmingham, and 67 Queen Victoria Street, London, E.C.), and Mr. W. C. Mountain, of Newcastle-on-Tyne, is the consulting engineer for the scheme. We are indebted to Mr. A. M. Russell and Mr. J. W. Liddell, the agent and manager of the colliery, for permission to publish this description, and to Mr. W. C. Mountain for technical details of the plant.

### THE WHARNECLIFFE PIT DISASTER

THE inquest with regard to the explosion which took place at the Wharneckcliffe Silkstone Colliery on May 30th was concluded on August 15th. Since our last note on the subject (*ELECTRICAL ENGINEERING*, August 6th, p. 442) several more witnesses gave evidence with regard to the possibility of the explosion having originated in the coal-cutter, which was at work at the time. Mr. J. Wroe said that it was difficult to determine whether the defects in the machine caused the ignition, although everything pointed to the ignition having taken place at the machine. Mr. H. A. Abbott (Inspector of Mines) was also of opinion that the gas was ignited by a spark from the coal-cutter.

Evidence was also given by Mr. R. Nelson (H.M. Electrical Inspector of Mines), who was of opinion that the coal-cutter was very likely to have been the cause. In the condition in which he saw it, sooner or later it would "quite certainly" ignite inflammable gas if surrounded by it. He referred to a case where sparking from a motor on the same voltage was known to have produced ignition. That the motor had been sparking could be inferred from the condition of the commutator and the fact that the cover had been recently removed. The absence of signs of blast in the interior of the case was no proof that the explosion had not originated there. This point had been shown by experiments with a switch-box containing a piece of cotton-wool. The safety of electric coal-cutters was a question of maintenance. If a machine was perfectly maintained, it was safe.

The following verdict was finally given by the jury:—That the twelve men lost their lives by an explosion of coal-gas on May 30th, caused by the stoppage and re-starting of the fan with a defective coal-cutting machine running at the face causing ignition, and the jury are of opinion that the whole of the management have been very negligent, but not criminally so."

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## MINING AND METALLURGICAL PATENTS OF AUGUST

### Mining.

TWO of the specifications published last month relate to the detection of dangerous gases in mines. No. 14,498/13, by G. Schauli, of Cheshunt, describes a system in which pipes are led from the pit-head to each separate working, so that samples of the gases can be drawn off and automatically tested for the presence of fire-damp and choke-damp. In specification No. 16,257/13, J. C. Rigaux, of Belgium, describes a combined lamp and fire-damp detector. The fire-damp detecting apparatus consists of a concertina device covered with platinum-black sponge which heats up and expands, thus opening a contact in the lamp circuit in the presence of fire-damp, causing the lamp to glow dimly. Specification No. 29,096/13, by W. Littlewood, of Barnsley, and No. 8,975/14, by J. A. Adlington, of Rotherham, both relate to signalling apparatus of the dial type. In the former the dial rotates to give the signal, and automatically returns to zero when the message has been complied with, whilst in the latter the signal is automatically recorded on a paper chart and remains visible until the next signal is given.

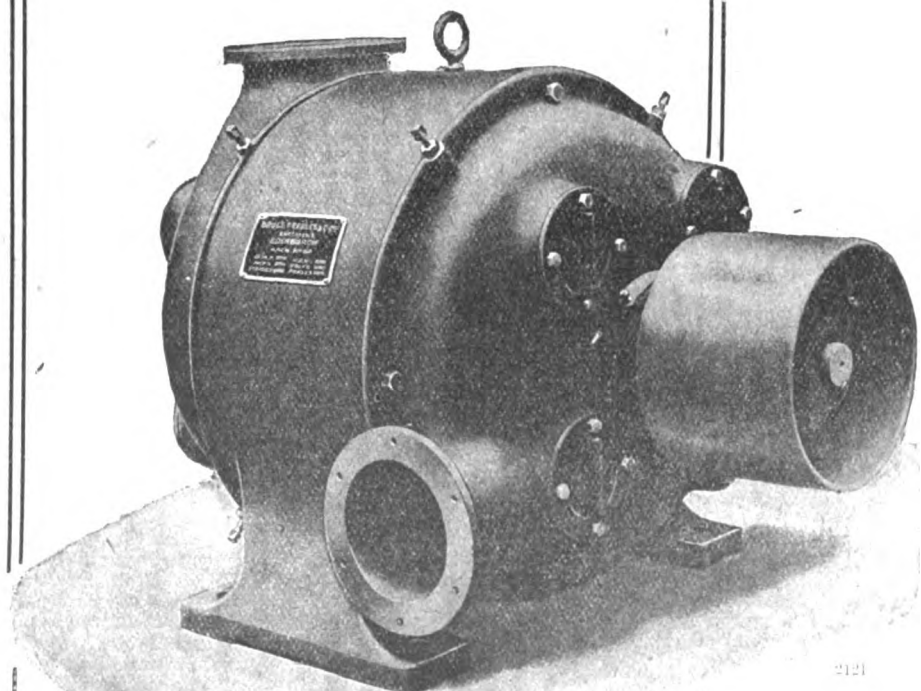
### Metallurgical.

In his specification No. 18,072/13, W. N. Crafts, of Oberlin, U.S.A., describes an improved construction of induction furnace of the type provided with a hearth basin for holding the whole of the charge. The core consists of two limbs of laminated iron passing through the lower portion of the hearth and united by external cross bars. The primary winding on these limbs is, of course, surrounded by a refractory casing, and the metal in the hearth forms the secondary. The hearth is arranged so that molten metal may be drawn off without disturbing the operation of the furnace. An improved form of electro-depositing tank of light and cheap construction forms the subject of specification No. 9,232/14. The patentee, W. Thum, of Hammond Lake, U.S.A., arranges suitable supports outside the tanks to bear the weight of the heavy electrodes. This allows a light construction of tank to be employed for containing the electrolyte.

**The Limiting Conditions for the Safe Use of Electricity in Coal Mining.**—A paper with this title, by Professor W. M. Thornton, read before Section G of the British Association in Australia, contained a summary of recent researches on the limits of electrical ignition of inflammable mine-gases and coal-dust. The lower limit of inflammability is 5·6 per cent. of methane in air by volume; a temperature of 200° C. lowers this to 5·1 per cent. The most inflammable mixtures are at 8 per cent. for continuous-current break-sparks, 10·2 per cent. for alternating-current breaks. Excess of nitrogen appears to markedly increase the necessary igniting current. With non-inductive circuits 1 ampere at 100 continuous volts is a typical value; the corresponding values with alternating current are 7 amperes at 40 cycles per second, 16 at 60, 20 at 80, and 29 at 100. By varying the inductance, the energy of an igniting break-spark is found to be constant at about 0·1 joule. Electric signalling bells have inductance up to 0·5 henry, and ignite gases at the trembler spark or signalling point. All electric lamps and fuses, however small, must be enclosed. Oscillations on a cable sheath caused by short circuits on the conductor will not ignite gas, but maintained leakage arcs from armouring are only slightly more active than break-sparks. Static discharges from 6-in. high-speed belting could not be made to ignite gas, nor the blue brush discharge from high-pressure conductors. Movements of clouds of dust have been shown to give electrification and to cause sparks, but the energy must be much greater than can be obtained experimentally in order that this should become dangerous. Wireless telegraphy operations on the surface do not induce sparking potentials underground. Capacity sparks in general from cables left insulated after being charged are very active, 0·002 to 0·005 joule causing ignition. The influence of gas in forwarding coal-dust explosions begins to be felt when  $\frac{1}{2}$  per cent. of gas is present. At 2 per cent. full ignitions are obtained at every trial. Coal-dust alone can be ignited by both continuous-current or alternating-current break-flashes, the former requiring 3·5 to 6 amperes at 480 volts in non-inductive circuits, the latter 14 amperes at 40 periods and on a power factor of 0·8. Continuous-current faults on the negative cable develop rapidly in the presence of moisture, and the cable is disintegrated. Alternating-current faults are self-healing, and a mechanical fault does not increase electrically on an alternating-current cable. Armouring is necessary under modern power conditions; lighting and signalling circuits must be equally well protected to prevent open sparking. The limits of safety are electrically low, but the risks of ignition are even now no greater than those attending the use of flame safety lamps, and they can be entirely prevented.

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## AN ELECTRICALLY-DRIVEN FURNACE-CHARGING MACHINE

AN interesting part of the equipment of a steel works is the furnace-charging machine, used to lift the charging boxes which have been previously filled with pig-iron or scrap, and to empty them into the furnace. To effect this a large number of motions have to be provided for. An excellent method of loading the charging boxes is by means of "Witton-Kramer" lifting magnets, as shown in Fig. 1. The actual charging machine is shown in Fig. 2. A large horizontal steel bar may be seen on the left-hand side. This is carried by the machine, and slides horizontally into sockets in the charging

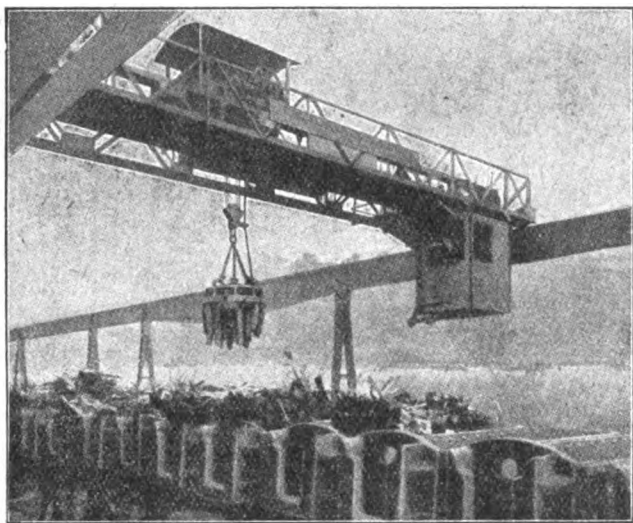


FIG. 1.—FILLING CHARGING BOXES.

box. By slewing round the arm together with the box, the charging machine traverses the length of the building until it arrives opposite the particular furnace to be charged. The arm is then adjusted in height, and the box thrust into the furnace, upon which the bar is revolved through 180° and the contents emptied into the furnace. On the completion of this operation the bar is withdrawn, together with the emptying box, slewed round, and the process repeated. There are in all seven motions, and although the duty imposed upon the machine is heavy—the loaded charging box weighing as much as 3 tons—the motions are fairly slow, and motors of no great size are needed. The following are the sizes of the motors and the speeds of the operation:—Hoisting, 20 h.p.

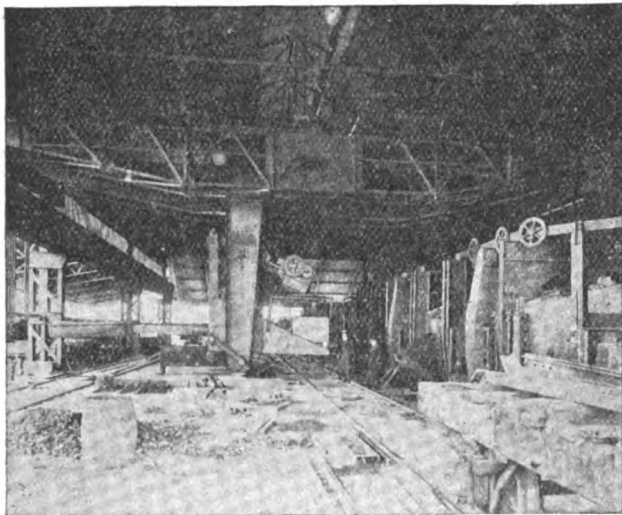


FIG. 2.—FURNACE CHARGING MACHINE.

at 40 ft. per min.; cross traverse, 40 h.p. at 220 ft. per min.; long travel, 60 h.p. at 300 ft. per min.; slewing, 10 h.p. at 6 r.p.m.; bar turning, 10 h.p. at 6 r.p.m.; auxiliary hoist, 10 h.p. at 20 ft. per min.; auxiliary traverse, 10 h.p. at 150 ft. per min. The charging machine which is illustrated was constructed by Wellmann, Seaver & Head (47 Queen Victoria Street, E.C.), the motors were supplied by the General Electric Co., Ltd. (Witton, Birmingham, and

67 Queen Victoria Street, E.C.), whilst the "Witton-Kramer" lifting magnet was manufactured by the Witton-Kramer Electric Tool and Hoist Co., for whom the General Electric Co., Ltd., are sole selling agents.

## CORRESPONDENCE CARBONS.

TO THE EDITOR OF *Electrical Engineering*.

SIR,—Our attention having been drawn to the article in your issue of the 27th inst., under the heading of "The Effect of the War on Street Lighting," we trust you will permit us to make the following observations:—The style of our firm is "Compagnie des Charbons Fabius Henrion," of which we are the London Branch, and are known as "Henrion Carbons." You mention that our factory at Nancy is small, but we would like to point out that our works at Pagny-sur-Moselle (not Nancy) is amongst the largest in the world, manufacturing carbons for open, enclosed, and flame arc lamps, and carbon brushes for dynamos and motors. Further, our output would compare quite favourably with Germany, and is about three times as large as Austria. Our factory is equipped on quite modern lines, and we are continually increasing our plant to meet the great demand for goods of our manufacture.

We would further like to add that since the outbreak of hostilities, we have supplied many thousands of carbons from stock to the most important corporations and industrial concerns, without charging the panic prices for which some vendors of carbons are asking, and about which many users are justly complaining. We have still a very fair stock, and also large consignments at Antwerp which we trust to get through shortly.

We trust you will give publicity to this letter, as we are anxious to correct the misleading impression that your article will probably make.

Yours faithfully,

HENRION CARBONS.

R. SERENA, Manager.

34 Victoria Street, Westminster, S.W.

August 31st, 1914.

## STANDARD CEILING ROSES

A STANDARD Specification (No. 67) for two- and three-plate ceiling-roses has been issued by the Engineering Standards Committee. The standardisation of plugs and other accessories is also being proceeded with, but it was thought advisable to publish the present specification separately to make it available as soon as possible. The main object has been to make it easy to replace a damaged fitting or cover without unduly hampering the design of these accessories. The Committee had the co-operation of the British Electrical & Allied Manufacturers' Association in preparation of the specification. The dimensions, screw-threads, position of holes, separating partition, &c., in the base and cover are defined, and a noticeable point is the use of different shaped plates for the different terminals for ease of identification in wiring. Some dimensions are given in inches and fractions, and some in mills.

**The Clifton Explosion.**—Evidence was heard as to the probable cause of an explosion at the William Pit, Great Clifton, on August 4th, in the course of the adjourned inquest on the victims on August 18th. According to some witnesses, the explosion originated in the neighbourhood of an electric pump just as the pump had been started, but the experts were divided in opinion as to the possibility of its having been caused electrically. Mr. W. C. Mountain was strongly of opinion that the explosion could not have started within the pump house, as it would have been difficult for a strong enough explosive mixture to be present, and there was no sign of explosion about the meter or switchgear. Mr. R. Nelson (H.M. Electrical Inspector of Mines), however, thought that appearances were consistent with the ignition having been caused by sparking at the starter, from which oil had leaked out. Mr. G. Poole (Inspector of Mines) agreed with Mr. Nelson, and thought it quite possible that an explosive mixture can have existed at the top of the pump house. There was often comparatively little force near the point of origin of the explosion. The jury found that it was impossible to say how the explosion arose.

**The Iron and Steel Institute.**—The autumn meeting which was to have been held in France is postponed, and no alternative arrangement has been made. The Papers that were to have been read will be printed, and members desiring to send in written contributions to the discussions are invited to apply for copies. The only Paper dealing with electrical matters is by Mr. L. Guillet on "Electrolytic Iron, its manufacture, properties, and uses."

## OPENINGS FOR THE EXTENSION OF OUR ELECTRICAL EXPORT TRADE

(Continued from last issue.)

**Australia.**—German electrical trade has increased greatly here during the past few years, and at a greater rate than British, although the United Kingdom still takes the lead. The comparative figures for imports in 1912 are:—

	From the U.K.	From Germany.	From Austria.
Dynamos and motors up to 200 h.p. ... ..	£185,000	£50,000	£1,000
Dynamos and motors over 200 h.p. ... ..	£30,000	£2,000	—
Regulating, starting and controlling apparatus ...	£26,000	£8,000	—
Fittings (metal or part metal) ... ..	£45,000	£10,000	—
Accumulators, batteries, arc lamps, insulated wires and cables, measuring instruments, insulating tape, &c. ... ..	£586,000	£59,000	£1,000
Arc lamp carbons ... ..	£1,000	£16,000	—

The British share of telephone switchboards and appliances has dropped from 44 to 35½ per cent. in three years, in relation to an increase in the trade from £105,000 to £164,000. Sweden and the United States are the chief competitors here. In porcelain insulators, not included in the above, Japan can quote the lowest price (but preference is given by the Post Office to goods not made by coloured labour), and Germany next lowest, Great Britain being quite out of the market in price. In electric lamps there is competition both with the German and with Dutch (Philips) lamps. Information as to the prospects of trade may be obtained from H.M. Trade Commissioner, Commerce House, Melbourne, and inquiries should take the form of a categorical series of questions.

**New Zealand.**—Up to 1912, Germany has only supplied direct about one-tenth of the electrical machinery attributed to Great Britain, but it is thought that the proportion is really greater, as the figures published refer to countries of shipment and not countries of actual origin. At all events, there is now much electrical work doing in New Zealand; Germany has been making a great effort to improve its position there, but there is every chance now of England regaining the proportion that Germany has acquired. H.M. Trade Commissioner reported on August 19th, in reply to a telegram, that an increasing demand for British goods may be expected, but prompt overtures should be made so as to anticipate competition from America.

**Canada.**—German competition has not been very keen, and the United States is our great competitor. H.M. Trade Commissioner reported on August 16th, in reply to a telegram, that the present financial condition of importers is generally satisfactory, and that British firms might extend their trade in carbons, electric apparatus, rubber, and zinc bars as the result of existing competition.

**India.**—It is stated that in 1912 about £270,000 worth of German electrical machinery was imported, but as Great Britain certainly far outdistances Germany in this market in India, it is possible that lamps are included in this classification. About 300,000 German metal filament lamps were bought in Germany in 1913.

**Egypt.**—German competition is of comparatively recent date, and the United States has been losing ground. On the other hand, Swiss competition has been keen for motors, &c.

**China.**—The German electrical imports are only slightly greater than ours. The introduction of electrical machinery for mines is worth attention, as mine-owners who have hitherto used primitive Chinese appliances are beginning to realise the advantages of up-to-date machinery. Last year it was reported that new electricity works were planned for Canton, Huchou (Chekiang), Tungchou (Kiangsu), &c. A Chinese tramway undertaking was started at Pekin at the end of last year with a capital of £750,000 for a 27-mile line. In Northern China it is recommended that direct connection with native firms should be avoided, and business confined to "foreign" importing firms already established on the market. The importation of German lamps is large throughout China. In Hong Kong the Germans have been supplying the bulk of the electrical materials used, but some Americans and British made lamps are also imported (B.C. caps are employed). America holds the market for fans.

**Japan.**—The German imports exceed British in all electrical apparatus except telegraph and telephone instruments, but only £1,000 of these latter were supplied from each country to Japan last year. The following are comparative figures for other electrical imports:—Insulated wires: Germany, £142,000; United Kingdom, £49,000. Meters: Germany, £15,000; United Kingdom, £3,000. Water turbines and Pelton wheels: Germany, £61,000; United Kingdom, £3,700. Dynamos, motors, &c.: Germany, £146,000; United Kingdom, £104,000. Incandescent lamps: Germany, £24,000; United Kingdom, £600. Ammeters and voltmeters: Germany, £5,500; United Kingdom, £2,900.

Japan does not manufacture turbines, but there are four or five companies manufacturing electrical machinery there, three of which are affiliated to American concerns. Japanese dynamos and motors are also exported to China. In addition, Japan has electric-lamp factories, although the imported lamps are considered superior. The following list gives some large hydro-electric plants for which inquiries have been issued, but orders not yet placed for machinery:—

Anglo-Japanese Hydro-Electric Co. (Hammamatsu district), one 2,900 b.h.p. set.

Seiyo Hydro-Electric Co. (Ise district), two 1,000 b.h.p. sets.

Hayadegawa Hydro-Electric Co. (Echigo district), three 2,350 b.h.p. sets.

Kyushiu Electric Light and Railway Co., three 3,850 b.h.p. sets.

The following is a list of large hydro-electric undertakings under construction in 1913-14:—

Inawashiro Hydro-Electric Co., six 11,250 b.h.p. sets. German turbines, English generators, German pipe line.

Kyushiu Hydro-Electric Co., five 5,600 b.h.p. sets. German turbines, U.S.A. generators, Japanese pipe line.

Kumamoto Hydro-Electric Co., four 2,150 b.h.p. sets. Swiss turbines, German generators, German pipe line.

Tone Hatsuden Kabushiki Kaisha, three 9,300 b.h.p. sets. German turbines, American generators, German pipe line.

Sagami Hydro-Electric Co., three 3,750 b.h.p. sets and three 2,350 b.h.p. sets. Swedish turbines, Swedish generators, Japanese pipe line.

Ibigawa Hydro-Electric Co., four 1,800 b.h.p. sets. German turbines, American generators, German pipe line.

Nippon Chemical Co. (near Wakamatsu), two 1,340 b.h.p. sets. Swedish turbines, German generators, Japanese pipe line.

Oji Paper Mill, Hokkaido, one 7,500 b.h.p. set. German turbine, American generator, German pipe line.

Kyoto Municipality, three 1,100 b.h.p. sets. Swedish turbines, American generators.

Government of Daito, Formosa: three 1,100 b.h.p. sets. Swiss turbines, German generators. Government of Rokkiri, Formosa, four 1,000 b.h.p. sets. Swiss turbines, German generators.

Bungo Electric Light Transmission Co., two 1,450 b.h.p. sets. German turbines, Japanese generators.

**Corea.**—The Gensan Hydro-Electric Co. and the Taikyuu Electric Co. commenced business at the end of 1912, and the Mokpo Electric Light Co., the Kunsan Electric Co., and the Seishu Electric Co. were expected to commence early last year; Messrs. Okura's undertaking at Shin-anju about last August, and the Shingishu Electric Co. about the end of last year. These all seem, however, to be quite small installations of less than 100 kw. each. The most promising towns have already been or are in course of being supplied with electric light and power, but the promotion of electrical enterprise continues nevertheless to occupy the attention of the Japanese authorities.

**Manchuria.**—The market for electrical supplies in Harbin is virtually in the hands of the local agency of a German firm and of another Continental firm who allow nine months' credit. There is practically no British electrical apparatus of any kind in North Manchuria.

**Norway.**—A certain amount of electrical machinery and other apparatus is manufactured in Norway, but the majority is imported from Germany, with smaller quantities from the United States, Sweden, and England. Electric current is cheap. There is some considerable sale for electric irons.

**Sweden.**—Although electrical supplies are extensively manufactured in Sweden, imports from foreign countries are considerable, especially from Germany. Lamps, lamp-holders, insulators, and wiring material are all imported, although there are a few Swedish factories. Edison screw sockets are used, and iron Bergmann conduits to a large extent. There are no large dealers in electrical supplies, and the business is in the hands of contractors, who do installation work and carry more or less limited stocks. Attention is only given to catalogues, &c., quoting on the metric system.

**Portugal.**—Although no up-to-date statistics are available, it is understood that Germany is sending more electric plant to Portugal than does the United Kingdom.

**Spain.**—The figures for German electrical exports to Spain, published in ELECTRICAL ENGINEERING of August 13th, are in all cases far greater than those from the United Kingdom, especially in the case of dynamos, motors, lamps, meters, and telegraphic apparatus. In fact, in everything but cable (which is apparently bought in nearly equal quantities from England and Germany, and also partly from some Spanish factories) and telephonic apparatus (which comes almost exclusively from Sweden and France), Germany supplies the greater part of the electrical trade. Some meters and electric heating apparatus are made locally, and there are also ten lamp factories, which, however, do not supply anything like the whole demand. Over two million German metal filament lamps were sold in Spain last year. The use of electric power is greatly extending.

**Italy.**—Electric cooking apparatus and irons have been imported from Germany. The extent of other electrical imports from Germany will be seen in the lists published in our issue of August 13th.

**Poland.**—According to the British Vice-Consul at Warsaw,

"the trade in electrical machinery and plant is entirely in German hands."

**Roumania.**—The volume of electrical trade is not large, but a number of provincial towns possess their own generating stations. Most of the machinery, lamps, and accessories is supplied from Germany and Austria, who have their own representatives. English is not much spoken, and catalogues in English are useless to send.

**Greece.**—Numerous firms have been established during the past ten years for the sale of smaller installation material, and their requirements are chiefly supplied from Germany. The Electrical Co. and the Gas Co. buy most of their material from their parent houses in France. Large extensions of telegraphs and telephones are projected by the Government.

**Argentine Republic.**—The powerful German company "Compañía Alemana Transatlántica de Electricidad," which supplies Buenos Ayres with electric light, makes all its purchases through Berlin. Germany has also a large connection in Rosario, and two leading American manufacturers are also represented in these places. There is no doubt that a large extension of British trade will be possible, but it is reported by telegraph that banks are for the moment refusing to give credit, and money is scarce in consequence.

**Chile.**—Practically all the electric light companies of the Valparaíso district are German and favour German supplies, and in the Valdivia and Llanquihue provinces are largely populated by Germans. The English language is little understood.

**Ecuador.**—Many municipalities intend to introduce electricity. Correspondence should be in Spanish.

The Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, E.C., will send copies of the pamphlet from which we have quoted most of the above notes to any *bona fide* manufacturer, and in some cases additional information may be available if specific questions are asked. The Department is, we understand, inundated with correspondence as a result of the publicity given to the "Trade War" idea in the general Press, so that requests for information in general terms should be avoided, and inquiries should state very definitely the particulars required.

The Commercial Intelligence Branch of the Board of Trade have also prepared lists of articles which inquirers desire (a) to purchase and (b) to sell. The first list states that inquiries have been received from firms desiring to purchase aluminium, general brassware, glass, glassware, china, and earthenware for electric fittings, celluloid cases, enamelled copper wire, magnets, magnetos, papier-mâché covers, and vulcanite rods, sheets, and mouldings for electrical apparatus, electric lamps and globes for same, and thin gutta-percha. Under section b, the list includes nearly every class of electrical goods. The lists may be obtained on application to the branch, and firms interested in any of the goods mentioned, either as buyers or sellers, should communicate with the director.

An enlarged sample room will also be established very shortly for the purpose of exhibiting samples of German and Austrian or Hungarian goods or materials which have competed with British products at home or abroad, especially those which are necessary for the continuance of British manufacture, but which it is now impossible for them to obtain from their previous sources. Firms who may wish to exhibit goods are invited to make application to the Commercial Intelligence Branch. It should be expressly understood, however, that the exhibition is intended exclusively for samples of goods which have formerly been obtained in Germany and Austria-Hungary alone and which firms may now desire to purchase in the United Kingdom. Notice will be given of the opening of the exhibition. A catalogue library will also be opened, and firms who may not desire to exhibit samples are invited to furnish catalogues of goods formerly received by them from Germany and Austria-Hungary, these catalogues to be classified by trades in order to be readily accessible to inquirers.

**The School of Mines, Treforest.**—A prospectus which we have received from the South Wales and Monmouthshire School of Mines at Treforest, which works in connection with the University College of South Wales, Cardiff, gives details of the very complete courses in mining engineering and allied subjects. The school is equipped with extensive laboratories, and a special feature is made of the Department of Electrotechnics, in which the principal lecturer is Mr. F. H. Downie. The next term commences on October 6th, and full particulars can be obtained from Mr. H. M. Ingledew, secretary, 4 Mount Square, Cardiff.

**The Northampton Engineering Magazine.**—The latest issue of the magazine of the Northampton Engineering College Union Society contains a number of contributions dealing with technical and non-technical matters of interest to students of the college, including abstracts of Papers read before the society.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,407.

What is the best procedure for the hardening, tempering, or other heat treatment of steel for the manufacture of permanent magnets of great constancy for measuring instruments?

(Replies must be received not later than first post Thursday, September 10th.)

### ANSWERS TO No. 1,405.

Two Chamberlain and Hookham ampere-hour meters, normally connected to read the "charge" and "discharge" current of a battery, were so connected that both meters read "discharge" current. This was done so that the "charge" meter (which accurately registered "charge" ampere-hours) could be used as a check on the "discharge" meter. But on comparing the two meter readings, the "charge" meter was found to be 18 per cent. slow, with the "discharge" meter. What is the explanation of this?—"DELTA."

The first award (10s.) is given to "F. R. C. R." for the following reply:—

As your correspondent mentions that the charge meter reads accurately, I take it that this has been recently checked, and is known to be correct. Very frequently it is arranged that one of a pair of battery meters reads incorrectly, so that if at the end of each charge the readings on both meters are the same, it is ensured that a certain percentage more current is put into the battery than is taken out. This tends to keep the battery in good condition. The usual method is to arrange for the charge meter to read 10 per cent. or 15 per cent. slow, and the discharge meter to read true ampere-hours. Occasionally, however, although this method is not so good, the charge meter is made to read truly and the discharge meter 10 per cent. or 15 per cent. fast. Possibly this has occurred in the case given, and the remaining 3 per cent. is easily accounted for, as each meter may be reading  $1\frac{1}{2}$  per cent. out in opposite directions. Another possible explanation is that the magnetic circuit of the discharge meter has at some time been broken, which would, of course, reduce the strength of the permanent magnet; in this type of meter the driving force is proportional to the magnetic force, whereas the braking effect is in proportion to the square of the magnetism. Consequently, if the strength of the magnet were reduced, the meter would speed up.

The second award (5s.) is made to "M.," who writes as follows:—

The reading of a B.O.T. meter or watt-hour meter is proportional to the product of the current and the volts in circuit, and as either of these may vary, it is necessary to provide the instrument with both a series and a shunt winding. In the case of a meter being used on a constant voltage circuit, the effect of the shunt winding will be a constant quantity. It is, therefore, possible to dispense with

the shunt winding in these circumstances, and so to reduce the cost of the instrument, but the calibration can only be made on the assumption that the voltage will remain absolutely constant. Such an instrument is called an ampere-hour meter, and it will only read correctly on the voltage for which it has been calibrated. When ampere-hour meters are used for measuring the charge and discharge current of a battery, they must be calibrated to suit different voltages, because the average discharge voltage of a battery is 2 volts per cell, whereas the voltage required to charge varies, according to the state of the cells, between approximately 2 volts and about 2.7 volts, so that the average charging voltage of a battery may be taken as approximately 2.35 volts per cell. If, therefore, we couple the charge and the dis-

charge meters in series, then the respective readings obtained will be as follows:—

Let  $R_1$  = Units read on charge meter.  
 $R_2$  = " " " discharge meter.  
 $i$  = Current.  
 $n$  = Number of cells.  
 $t$  = Time in hours.

Then  $R_1 = 2.35 \text{ int.}$ , and  $R_2 = 2 \text{ int.}$

Hence the reading obtained on the charge instrument will be 17.5 per cent. higher than that on the discharge meter, which is apparently what the questioner found to be the case. The questioner states that the "charge" meter was found to read 18 per cent. slow. This obviously was intended to mean high.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published August 27th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

18,000/13. **Liquid Resistances.** AKT.-GES. BROWN, BOVERI ET CIE. The electrodes are suspended in a vessel, the lower end of which is sealed by liquid contained in a tank beneath. This tank is suspended on ropes which pass over pulleys, and is counterbalanced by suitable weights, so that it may be raised or lowered easily. Raising this tank decreases the resistance. No flexible leads or rubbing rings and brushes are needed. The specification also describes a method of maintaining the required quantity of liquid in the tank by means of a float valve. Two figures.

18,321/13. **Telegraphy.** UNITED TELEGRAPH & CABLE CO. and H. BRUCE. A system by which alternating or interrupted current can be used for ordinary telegraphic signalling, particularly over ocean cables. An alternator is used as the source of supply, one pole being earthed and the other connected to the line through a transmitting key, a condenser, and a sensitive relay. The signalling apparatus, which is the same at each station, consists of a sensitive relay controlling a sluggish relay, which in turn operates the contacts in the battery circuit of the sounder. The sensitive relay responds to the alternations of the current and keeps the sluggish relay energised until the circuit is broken at the transmitter key. Hence the sounder is not affected by the alternations. When alternating current is used for transmission, the capacity and resistance of the cable do not interfere with the speed of working, as in the case of direct-current systems. One figure.

18,447/13. **Improved Incandescent Lamps.** B.T.-H. Co. (G.E. Co., U.S.A.). A device for increasing the useful life and maintaining the initial efficiency of tungsten filament lamps. A small quantity of potassium thallium chloride is contained in a small open tube inside the bulb. Before the latter is sealed, a small quantity of pure dry nitrogen is admitted at a pressure of from 10 to 50 microns. One figure.

22,223/13. **Manufacture of Arc Lamp Carbons.** C. CONRADTY. Relates to the manufacture of carbons which are coated on the outside with a mixture of chemicals. Before the coating is applied the hard outer skin of the carbons is removed, e.g., by sand-blasting, leaving a rough porous surface to which the chemicals adhere very firmly.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** RAILING and ANGOLD [Automatic shunting devices] 24,074/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** CUNLIFFE & CUNLIFFE [Cables for power transmission] 18,170/13.

**Dynamos, Motors, and Transformers:** WADE (Heyman) [Converter] 25,846/13.

**Electrometallurgy and Electrochemistry:** MACKENZIE (Automatic Welding Co.) [Tube-welding machines] 15,858/13; BEAVER and CLAREMONT [Joining apparatus] 21,646/13.

**Heating and Cooking:** BERRY [Supply of electricity for heating] 16,040/13.

**Ignition:** CAMPBELL [Spark plugs] 2,628/14.

**Storage Batteries:** DININ [Accumulators] 14,119/14.

**Switchgear, Fuses and Fittings:** HOLT and SMITH [Circuit

breakers] 24,594/13; B.T.-H. Co. and WEDMORE [Switches and fuses] 27,182/13; YOUNG [Fuse-holders] 28,075/13.

**Telephony and Telegraphy:** MARCONI and ENTWISTLE [Transformers for high-frequency currents] 18,502/13; FESSENDEN [Submarine signalling apparatus] 18,765/13; THOMPSON (Soc. Anon. des Telegraphes Edouard Belin) [Transmission of photographs] 19,966/13; GELL [Telegraphic receiver] 21,036/13; C. F. CASELLA & Co. and ABRAHAM [Perforator] 26,252/13; WESTERN ELECT. Co. (Woodward) [Relays] 3,699/14.

**Traction:** FRANCHIMONT and CÉSAR [Operation and locking of rail points] 13,682/13; STABIE [Train-control systems] 18,008/13; WILLOCO, REGNAULT ET CIE [Starting and lighting of vehicles] 3,919/14.

**Miscellaneous:** BANFIELD [Intermittent driving] 66/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Incandescent Lamps:** FORNANDER [Portable lamp supports] 10,395/14; A.E.G. [Incandescent lamps] 18,369/14.

**Telephony and Telegraphy:** PIERCE [Relay apparatus] 15,681/14; SIEMENS & HALSKE AKT.-GES. [Telephone installations] 18,239/14.

The following Amended Specifications may now be obtained:—

**Incandescent Lamps:** C. TRENZEN [Manufacture of ductile tungsten] 26,800/12; F. H. REEVES [Anti-vibrator for lamps] 19,857/13.

### Amendment

14,741/13. **Regulator for Accumulator Charging.** W. H. SCOTT. In pursuance of leave previously granted, the above Specification has been corrected.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

15,748/00. **Arc Extinguisher for Fuses and Switches.** G. W. PARTRIDGE. A small metallic vessel containing compressed carbon-dioxide and having a fusible end, is arranged in the switch or fuse-box so that if an arc forms, the end of the vessel melts and a jet of gas rushes out to extinguish the arc. Two vessels may be used if necessary, and they should be easily replaceable. The claims also include for the use of an explosive cartridge which is fired when the arc forms, so that the rush of gas extinguishes the flame.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** A. E. G. [Power transmission systems] 11,400/09, 13,798/09.

**Ignition:** H. H. LAKE (Fabrik Elektrischer Zünder Ges.) [Blasting fuses] 9,966/05.

**Instruments and Meters:** G. CHARLTON [Pressure gauge] 10,984/09; C. R. DARLING [Thermometer] 11,187/09.

**Switchgear, Fuses and Fittings:** B.T.-H. Co (A.E.G.) [Motor controller] 11,070/07; W. C. KIRWAN and K. QUANEY [Mercury switch] 26,088/09.

**Telephony and Telegraphy:** G. ERDMANN [Wireless signalling] 10,156/08.

**Miscellaneous:** P. T. SIEVERT [Glass manufacture utilising an electric arc] 10,842/03, 10,843/03; A. P. JONES ("Long Arm" System Co.) [Operation of bulkhead doors] 9,871/05.



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### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

We trust that the Government is not overlooking the immediate necessity of laying further cables in the English Channel to supplement the few cables which are at present in existence to the west of the numerous ones which land near Calais and Boulogne, as it is, of course, possible that attempts to cut the latter may be made by our practical and well-informed enemy. Cables further west would be safe from attack, and their land-line connections in France easier to guard. Cable-laying at this season of the year is a comparatively quick and easy operation, and it occurs to us that there may actually be a sufficiently long cable "in stock" which was originally destined for another purpose. A cable across the Channel could be laid, jointed, and connected up in two days on emergency; there are men and cable-ships in the country who could do this at once, and even if a cable had to be made it is not impossible that this could be done in sufficient time for it to be of utility.

In answer to a question in the House of Commons on Monday, the Postmaster-General said it was not thought advisable at present to relax the regulations prohibiting the use of codes for cabling to distant countries.

Telegrams in English and French can now be accepted for Switzerland.—On August 27th the Netherland Indies Administration stated that telegrams sent by belligerent Governments or their representatives could only be written in clear Dutch, French, English, or German, and must bear the signature of the sender. Any telegrams containing particulars of movements of troops or naval vessels are not admitted under any circumstances.—The Press stated on the same date that the wireless installation in Togoland had been destroyed by the Germans before the Colony surrendered to the English Forces; and also that the French Government prohibited the use of wireless on merchant ships in French ports and territorial waters, as confirmed by the Board of Trade.—The Austrian Government does not accept or permit in transit telegrams for Japan. A similar notice was also issued by Hungary.—The Japanese Government notify that there is no longer any language restriction on telegrams for Japan.—The New Zealand Government has taken control of the wireless station in Apia in the Samoan group.—Owing to an interruption of land-lines in Mexico, communication with British Honduras has been cut off, and messages can only be sent by post from New Orleans.

The Directors of Marconi's Wireless Telegraph Co. announce their regret that, owing to the present impossibility of obtaining repayment of money lent by the Company on short loan against securities prior to the moratorium, they are compelled to postpone posting the dividend warrant, which otherwise would have been issued on Monday.

A course of twelve advanced lectures on the theory and practice of Radiotelegraphy, by Prof. J. A. Fleming, will commence at University College on October 28th. Six will be given before, and six after, Easter. The fee for each group of six is £1 11s. 6d. The syllabus includes theoretic considerations, production, and detection of oscillation, high-frequency measurement, practical wireless telegraphy and apparatus, problems of transmission, and recent developments.

**Uses of X-Rays.**—An article in a recent number of the *General Electric Review* describes some interesting applications of the Coolidge "X"-ray tube, the British Patent for which was published a short time ago (see *ELECTRICAL ENGINEERING*, July 30th, p. 432). In addition to the well-known uses of X-rays in the medical world, both for photographic purposes and for the treatment of certain complaints, other fields of application are found in botany and biology. Photographs can be obtained showing the various stages in the development of plants or animals. Thus it is possible to observe the gradual formation of a chicken inside the egg. It is interesting to note that whilst diamonds are practically transparent to the rays, counterfeit stones are almost opaque.

**MARRYAT**  
**ARMATURE**  
**REPAIRS**  
**DYNAMO & MOTOR HOSPITAL,**  
**28, HATTON GATE, LONDON, E.C.**

## "ELECTRICAL ENGINEERING" TRADE SECTION

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**FITTINGS AND ACCESSORIES.**—A fine illustrated catalogue is to hand from J. & W. B. Smith (15-23 Farringdon Road, E.C.). An enormous variety of electrical fittings and accessories are dealt with, including shades and reflectors, conduit fittings, radiators, cookers, fans, bells, and other articles too numerous to mention here. The lampshades can be supplied in either glass, bead, or silk, and in the latter connection a number of tasteful patterns of the various materials in stock, which are included in the catalogue, should be of assistance to prospective buyers who are unable to pay a personal visit to the showrooms. The large range of indirect lighting fittings to which a number of pages are devoted bear the marks of careful design, in which every care has been taken to ensure a pleasing effect without sacrificing mechanical strength. A point of interest at the present moment is that practically all the goods which are listed are British made.

**NOVELTIES.**—A leaflet from the Standard Trading Co. (25 Victoria Street, S.W.) calls attention to a pretty little miniature arc lamp forming a charm for the watch chain or a lady's bangle. We understand that these are made in this country.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

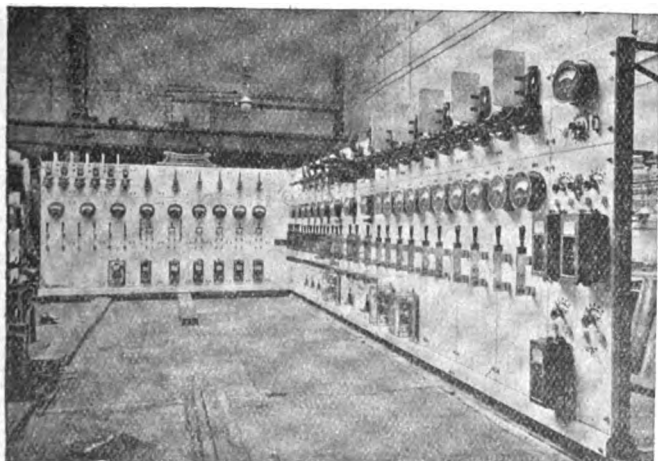
**ROLLING STOCK.**—The latest pattern of steel car bodies with centre as well as end doors, used on the Bakerloo Tube Railway, is illustrated in the *Brush Budget*.

**ELECTRIC IRONS.**—A card from the British Prometheus Co. (Salop Street Works, Birmingham) illustrates three patterns of electric irons.

**BELL PUSHES, &c.**—A new list of bell-pushes, push-keys, and kindred accessories, has been issued by A. P. Lundberg & Sons (477 to 489 Liverpool Road, Islington). Most of these are fitted with the Company's patent "Pixy" push movement, with its parallel movement and real platinum contacts. This is mounted in a number of styles for flush and surface work, and also made up in pendant form. Substantial designs of push-switches with spring-on or spring-off action are listed, including special forms for use in narrow situations. Plugs and sockets for bell circuit connections are also dealt with.

### A LARGE SWITCHBOARD

**DURING** the recent Convention of the Incorporated Municipal Electrical Association in Birmingham, it will be remembered that a visit was paid to the Witton works of the General Electric Co., Ltd., of 67 Queen Victoria Street,



LARGE SWITCHBOARD FOR CARDIFF.

London, E.C. Among the equipment in course of erection which was inspected was a large continuous-current switchboard which has just been constructed for the Cardiff Corporation.

This board consists of twenty-five panels, and is over 45 ft. in length. It has been designed for controlling a supply for both lighting and traction purposes. The panels themselves are constructed of fine white marble, and, as will be seen from the illustration, the board presents a very attractive appearance. An innovation for heavy current switchboards has been embodied in the arrangements for the back of the board. Instead of being carried from the usual brackets, the busbars are supported by the stems from the switches. These stems, therefore, serve both for a mechanical support and for the current-carrying connection.

### NEW FITTINGS FOR INDIRECT LIGHTING

**THERE** are some cases where the use of indirect lighting has not been adopted owing to objections to the use of ceiling fittings. To meet this, the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), has brought out a series of designs of wall brackets for indirect



SHERATON DESIGN BRACKET FOR INDIRECT LIGHTING.

lighting, of which one is illustrated here. These are made with one, two, or three arms, and employ exactly the same kind of upturned reflectors as is familiar in the older suspended bowl fittings. A number of different designs to harmonise with various styles of decoration are made.

**Dispute as to Ownership of Carbons.**—We published a note last week (*ELECTRICAL ENGINEERING*, August 27th, page 473) on a case of alleged theft of a stock of about £2,000 worth of arc lamp carbons from the works of the Foster Engineering Co. at Wimbeldon. It now appears that the carbons were removed by representatives of the Beck Engineering Co., who claim that since the determination of an agreement between them and the Foster Co. the stock of carbons is their property. The matter is to be settled in the High Court, and Mr. Justice Shearman, we are informed, had already made an order for the carbons to be held by the Foster Co. pending the result of the action. Meanwhile the persons who removed the carbons by motor vans in the middle of the night from the Foster works have been committed for trial.

**Birmingham Manufactures.**—The Commercial Year Book of the Birmingham Chamber of Commerce, which contains very full information as to the industrial resources of the Birmingham district, including a considerable section on electrical matters, should be of special utility at the present time in connection with the efforts that are now being made to recapture the trade which has gone to our enemies.

**Ediswan Lamps.**—We are informed by the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex) that rapid advance is being made in their extra glass-blowing accommodation, with a view to supplying the demand for lamp bulbs hitherto met by Germany. We are pleased to hear that the employees have joined almost in a body the Rifle Club formed by the Company.

**The British Engineers Association.**—We have received a copy of the revised edition of the official Directory of this association, which includes classified lists of British manufacturers of all classes of engineering appliances. The primary object of the association was to assist British export trade to China, but in the present situation this Directory has a wider interest.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—Three-phase motors for driving workshop and other machinery are required for the Melbourne Suburban Railways. Consulting Engineers, Merz & McLellan, 32 Victoria Street, London, S.W. Tenders to the Agent-General for Victoria, Melbourne Place, Strand, W.C., by October 12th.

**Barford (Warwick).**—A local electric lighting company is being formed. Mr. Smith Ryland is Chairman.

**Cleckheaton.**—Switchgear and feeders are required. Borough Electrical Engineer.

**Eccles.**—Coal elevator and conveyor. Borough Electrical Engineer. September 21st.

**Portrush.**—The electric lighting scheme prepared by Messrs. J. Woodside & Co., of Belfast, estimated to cost £8,000, is to be proceeded with. A loan is to be applied for.

**Spain.**—H.M. Consul at Barcelona reports that the hydro-electric schemes which are in course of realisation have discouraged the importation of steam engines and boilers, but have stimulated the imports of electrical machinery.

**Warrington.**—Twelve months' supply of earthenware conduit. Borough Electrical Engineer, September 15th.

### Wiring

**Aberdeen.**—Torry United Free Church (£5,000).

**Blackpool.**—Printing works for H. Maxwell & Co.

**Bromley (Kent).**—New infirmary.—Two schools (£26,000).

**Darwen.**—Public baths. Borough Engineer.

**Eccles.** School at Winton.

**High Wycombe.**—Workmen's dwellings (£11,200).

**Huddersfield.**—Public baths. Cambridge Road.

**Ipswich.**—Isolation hospital (£8,000).

**Watford.**—New infirmary. £10,500.

### Miscellaneous

**Australia.**—Telephone instruments, measuring instruments, and carbon- and metal-filament lamps. Deputy Postmaster-General, Sydney. October 7th. Further particulars at 73 Basinghall Street, E.C.

**Burnley.**—Electrical supplies for Guardians. Clerk.

**New Zealand.**—Wall telephones. Public Service Stores Tender Board, Wellington. September 8th. (This information is only of use to firms having agents in New Zealand who can be instructed by cable).

**Warrington.**—Electrical supplies for Guardians. Clerk. September 9th.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Bradford.**—It was stated in yesterday's *Times* that the order given some time ago by the Electricity Committee to a German firm for a 5,000 kw. turbo-generator was yesterday

transferred to the Westinghouse Co., Manchester, "who accepted it at a specially low price to find employment for their workpeople."

**Edinburgh.**—A contract for cable has been entered into with the British Insulated & Helsby Cable Co., Ltd., in substitution of one placed with a German firm a short time ago.

**London: H.M. Office of Works.**—A contract for twelve months' supply of standard type "Royal Ediswan" drawn-wire, and also "Royal Ediswan" carbon and special type lamps, has been placed with the Edison & Swan United Electric Light Co.

**Manchester.**—Messrs. Chamberlain & Hookham have received a contract from the Corporation for the supply of meters.

## LOCAL NOTES

**Bridlington: Electricity Profits.**—There was nett profit of £1,378 on the electricity undertaking last year. Of this, £356 has been spent on meters and £500 placed to renewals fund, the remainder being left as a floating balance in the treasurer's hands.

**Brighton: "Stealing" Electricity.**—The local magistrates last week convicted Rose Roper, of Grand Parade, for fraudulently consuming electricity. The defendant had a shilling slot meter, and it was found that the cable had been tampered with so that a large quantity of the current was not registered. A fine of forty shillings was imposed.

**Cleckheaton: Extensions Postponed.**—The Council has decided to defer proceeding with the projected extension scheme in its entirety for two reasons. One is that negotiations are to be opened up with the Yorkshire Electric Power Co. for a bulk supply, which many people in the town favour, and the other is the amalgamation with Liversedge and Gomersal, the inhabitants of which it is felt should have a voice in the matter.

**Clones: Electric Lighting.**—The power house of the Clones Electric Light & Power Company was put into operation last week. A feature of the installation is the complete system of street lighting, which consists of a combination of centrally-suspended clusters of lamps, and bracket lamps.

**Haslingden: Half-Watt Lamps.**—The Electricity Committee has expressed its satisfaction with experiments with half-watt lamps.

**Llanidloes: Purchase of Electric Supply Co.**—A Local Government Board inquiry was held last week concerning a loan for purchasing the local electric supply company.

**Sheffield: Street Box Explosion.**—Two explosions in street boxes on Sunday caused some little excitement. It is said that the metal cover of one box was blown as high as a house, but fortunately nobody was injured.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**British-Made Woodwork.**—C. Jennings & Co. (955 Pennywell Road, Bristol), announce that they are giving usual credit terms, and are endeavouring to keep the whole of the works going, especially in the direction of lines of woodwork previously made abroad.

**Bankruptcy.**—The trustee in the bankruptcy of F. T. Johnson, Electrical Engineer, 60 Eltesley Avenue, Cambridge, has been released.

**Telephone Apparatus.**—The Sterling Telephone & Electric Co., Ltd. (210-212 Tottenham Court Road), announce that the discount off all their lists except the following, is now 20 per cent. instead of 33½ per cent. The prices in the lists of military telephones, apparatus for wireless telegraphy, and blasting machines are withdrawn, and the advance of 10 per cent. in the prices of bells and indicators is now withdrawn.

**Change of Address.**—Simplex Conduits, Ltd., have removed their Liverpool branch from 1 Dawson Street to more extensive premises at 96 Whitechapel, Liverpool, where greatly increased stocks are now held.

**Electric Clocks.**—Gent & Co., Ltd. (Leicester), remind us that their "Pulsynetic" clocks are made entirely in England, and that they were the introducers of "Sinevar" British-made non-expanding nickel-steel, with which all their pendulums are made.

### INSIST ON HAVING

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Red Hot Fires  
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London Showroom—

62, Holborn Viaduct, E.C.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 402 [VOL. X., No. 37]  
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THURSDAY, SEPTEMBER 10, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price **1d.**

### SUBSCRIPTION RATES.

United Kingdom. **6s. 6d.** per Annum.

Canada. **8s. 8d.** per Annum.

Other Colonies and Abroad. **13s.** per Annum.

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OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

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Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

Corrections in Standing Advertisements, *Monday first post.*

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

AMONGST the Patent specifications issued last week were two relating to the construction of power transmission cables and submarine signalling respectively.—Opposition has been entered to the grant of a Patent relating to telephone systems.—Patents for a high tension switch, the loading of telephonic transmission lines, an arc furnace and the Phillips commutator grinder expire this week after a full life. (Page 492.)

In an article on the effect of the war on the dynamo and motor industry, the directions in which greater activity may be developed are indicated and the general position is reviewed. (Page 493.)

THE feasibility of running a 460-volt D.C.-generator in parallel with several 230-volt machines is discussed in our "Questions and Answers" columns. (Page 494.)

A DESCRIPTION of the equipment of an up-to-date cinema theatre where electrical energy is generated on the premises and is also obtained from the single-phase supply mains, is given. (Page 495.)

OUR Trade Section contains an illustrated article on the Lemington lamp bulb factory, where the bulbs for Osram and Robertson lamps are blown; a description of some applications of electric drive in cider mills; and correspondence with regard to matters arising out of the war. (Pages 497 to 499.)

THE Engineering Standards Committee has issued a report dealing with the resistance of steel conductor rails and defines a new method for specifying these.—We summarise the revised regulations and bye-laws regarding the use of electric power on the L.C.C. Tramways.—A special report dealing with electric vehicles is to be drawn up by the South Shields Borough Electrical Engineer. (Page 496.)

THE Bamfield-Fanning Island cable has been cut by a German cruiser. (Page 496.)

CABLE is required at Warrington, Sunderland, Monmouth, and Torquay; generating plant, sub-station machinery and motors at Manchester; generating plant at Torquay, Southend, and Sunderland; electric supplies are required at Wolverhampton and Halifax; tramcars at Johannesburg; and telephone switchboards in Australia. (Page 500.)

THE first 5,000-kw. set in the new Bolton generating station has been started up.—There was a considerable increase in the net revenue at Aberdeen last year, and but for the present position of affairs a reduction in tariff would have been recommended.—Arc lamps are only to be lighted on Saturday nights at Sleaford in order to make the fullest use of the supply of carbons.—A 200-kw. generator ordered for the Stamford electricity works has been commandeered by the War Office. (Page 500.)

THE Mordey-Fricker Electricity Meter Co. is to be transferred to the British Insulated & Helsby Cables, Ltd.—A 6 per cent. dividend is recommended by the British Electric Transformer Co.—The Clyde Valley Electrical Power Co. reports a satisfactory year. (Page 500.)

THE proposed Bradford electrical exhibition next month is to be postponed. (Page 500.)

## UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

The 1914-15 session at the University of London (University College) begins on October 5th. Three-years' courses are given in mechanical, electrical, civil, and municipal engineering, and arrangements are made for degree and diploma courses, post-graduate work and research and special courses.

The Borough Polytechnic Institute, Borough Road, London, re-opens on September 21st. A four-years' course in electro-technics is given.

Other announcements will be found on pages vi and vii.

**Gone to the Army.**—We have received a postcard from our Paris contemporary, *La Lumière Electrique*, as follows:—"In answer to your letter of the 25th, we let you know that we have ceased to issue our paper since the beginning of the war, first of August, all us being gone to the army."—We are also informed that *l'Electricien* has suspended publication until the close of the war.



## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published September 3rd, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

18,170/13. **Cables for Power Transmission.** J. G. CUNLIFFE and R. G. CUNLIFFE. Each strand of the cable is coated with insulating enamel, and around the exterior of the cable is wound a similarly treated wire which serves as a protection. The whole may then be encased in a lead sheath. The advantages claimed are: higher permissible current density, low cost of manufacture, and comparatively high mechanical strength.

18,765/13. **Submarine Signalling.** R. A. FESSENDEN. The side of the ship is caused to vibrate rapidly so as to produce compressional waves similar to sound waves in air. A thin cylinder, rigidly attached to the ship side, forms the secondary of a transformer, and moves to and fro when the primary windings of the latter are excited by an alternating current. The compressional waves cause the sides of the receiving ship to vibrate in unison and induce currents in the windings of a similar transformer. These currents actuate a special form of telephone receiver. A microphone and a strong battery may also be used to excite the primary of the transformer on the sending ship for telephonic transmission. Four figures.

25,846/13. **Rotary Converter.** H. WADE (*D. A. Heyman*). The armature winding of the machine is connected to slip rings, and both the field and armature are first supplied with alternating current. When the machine has run up to synchronism, a switch is closed, either automatically or by hand, which arranges the connections so that a rectifying commutator on the armature shaft supplies both the field and the d.c. line with direct current, the armature still being supplied from the A.C. circuit. Four figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** STEINMANN [Mercury vapour lamps] 10,523/14.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** DAY [Couplings] 21,070/13; RAILING and TAYLOR [Conduit systems] 25,363/13; VAUGHAN [Insulating overhead wires] 25,790/13.

**Dynamos, Motors, and Transformers:** OTIS ELEVATOR Co. (*Otis Elevator Co.*) [Means for reversing motors] 4,211/14.

**Ignition:** KOPF [Sparking plug] 18,727/13.

**Incandescent Lamps:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Lamps] 18,448/13; GLADITZ [Manufacture of tungsten wire] 20,122/13.

**Switchgear, Fuses and Fittings:** MOND (*Maschinenfabrik Oerlikon*) [Controllers] 16,208/13; ART. GES. BROWN BOVERI ET CIE [Liquid resistances] 18,500/13; PRIOR & BUTTERWORTH & DICKINSON, LTD. [Switch-actuating apparatus] 19,141/13; B.T.-H. Co. and GIVEN [Motor control mechanism] 19,443/13; CREDENDA CONDUITS Co. and SUMMERHAYES [Resistance-wire supports] 26,704/13; NEWTON and NEWTON BROS. [Automatic starters] 8,178/14.

**Telephony and Telegraphy:** MATHYS (*Miller*) [Lock-out telephones] 18,609/13; CORWIN [Exchange systems] 19,305/13; HULTMAN [Automatic selector switches] 16,234/14.

**Miscellaneous:** YOULDON and YOULDON [Piano players] 15,733/13; SHENKER [Burglar alarms] 18,983/13; MAJOR, STEPHENS, and SMITH, MAJOR & STEPHENS, LTD. [Locks for lift gates] 21,050/13; B.T.-H. Co. [Ozone apparatus] 21,779/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Electrometallurgy and Electrochemistry:** A.E.G. [Welding machines] 16,126/14.

**Instruments and Meters:** LANDIS & GYR [Prepayment meters] 18,464/14; WILSON [Energy meters] 18,494/14.

**Switchgear, Fuses, and Fittings:** MAHONEY [Circuit interrupters] 16,318/14.

**Telephony and Telegraphy:** BRINKMANN [Contact apparatus for telephones] 17,863/14.

**Miscellaneous:** HAMMOND [Radio-dynamic control of gyroscopes] 18,408/14; DEL CASTILLO [Bell-ringing apparatus] 18,608/14.

### Opposition to Grant of Patents

14,524/13. **Telephone Systems.** W. AITKEN. Opposition has been entered to the grant of this Patent.

13,282/12. **Manufacture of Ductile Tungsten.** P. SCHWARZKOPF, S. BURGSTALLER, and WOLFRAM LAB., DR. J. P. SCHWARZKOPF. The grant of this Patent has been allowed by the Law Officer.

### Expiring and Expired Patents

The following Patents expire during the current week, after a *life of fourteen years*:-

16,130/00. **High Tension Switches.** B.T.-H. Co. (*E. M. Hewlett and W. Le R. Emmet*). The switch mechanism is suspended from a cast-iron frame which is bolted to the back of a slate or marble switchboard, and a handle at the front of the board operates the switch through levers. An oil holder is clamped in position on the underside of the frame, so as to enclose all the live parts of the switch in oil.

16,290/00. **Loading Telephone Lines.** G. A. CAMPBELL. The invention relates to the construction and arrangement of the coils used for the loading of long telephone lines. Copper wire is wound on a mandrel which is then withdrawn and a block of wood inserted at the centre of the coil. Two circular bundles of iron wire are introduced at opposite ends of the coil so that one end of each bundle touches the wooden block. The free ends of the bundles are then bent round the outside of the coil and bound in position, the whole being afterwards enclosed in a metal case. The claims also include for the provision of a series of gradually varying inductances at either or both ends of the transmission line to reduce "reflection" effects.

16,293/00. **Improved Arc Furnace.** J. IMRAY (*Soc. Elect. Metall. Française*). Where it is desired to prevent combination between the carbon electrodes of the furnace and the material which is being treated, the former are arranged vertically above the surface of the latter, so that two arcs in series are formed, the current flowing from one electrode, through the first arc, through the material and to the other electrode via the second arc. Arrangements are made to give the electrodes a vertical feed either automatically or by hand so as to maintain the arcs.

16,389/00. **Commutator Grinder.** J. PHILLIPS. An apparatus for trueing up the surface of commutators by an emery wheel, driven through a friction wheel and belting from the commutator which is being ground. The belt drives directly on to the spindle of the emery wheel, which is at the same time fed axially along the commutator by a worm and wormwheel. A longitudinal groove is cut on the worm, and when the grinding wheel reaches the end of its travel the worm spindle is turned so as to put the worm wheel out of mesh, thus allowing the grinding wheel carriage to be moved back ready for a fresh cut. An alternative method of feeding the grinder axially by the use of bevel wheels driving a crank and connecting rod is also described.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors and Transformers:** J. G. V. LANG [Dynamo and motor control] 11,974/07.

**Electrometallurgy and Electrochemistry:** H. RÖCHLING, J. SCHOENAWA, and W. RODENHAUSER [Furnace electrodes] 11,917/07.

**Ignition:** F. T. COTTON [Ignition device for gas-burners] 10,856/08.

**Incandescent Lamps:** A. JUST, F. HANAMANN, and VEREINIGTE ELECT. A.G. [Manufacture of tungsten filaments] 11,944/06; E. L. ELLIOTT [Lamp supports] 9,991/07; H. F. JOEL [Miners' lamps] 11,106/08, 9,693/09.

**Instruments and Meters:** EVERSHED & VIGNOLES and S. EVERSHED [Testing of insulation of lighting circuits] 11,509/03; CHAMBERLAIN & HOOKHAM and S. H. HOLDEN [Energy meters] 10,893/08.

**Switchgear, Fuses and Fittings:** T. VON ZWEIFBERGK [Motor control apparatus] 2,750/07; M. W. BRONDUM [Switch-operating mechanism] 10,715/08.

**Telephony and Telegraphy:** F. RITCHIE [Telautographic apparatus, i.e., for transmission of writing] 11,956/06.

**Miscellaneous:** M. A. ADAMS (*W. E. D. Stokes*) [Control of hydraulic lifts] 11,645/04.

## THE EFFECT OF THE WAR ON THE DYNAMO AND MOTOR INDUSTRY \*

THE effect which the war has had upon the manufacturers of dynamos and motors in this country is of a complex character. That the ultimate result will be greatly beneficial there is no room to doubt, and, in fact, the improvement is already being felt by some firms; others, however, are meeting difficulties which are an inevitable result of the "tightness" of money, and deriving only limited advantage from the transfer of orders to them of plant previously ordered abroad. Before going further, we may at once dispel the illusion that a large volume of orders from municipal corporations for electrical machinery has been placed on the Continent during the past few months and has now to be transferred to British firms. There are a few cases of this, notably that of the 5000-kw. turbine and alternator which was given to the Bergmann works in Berlin by the Bradford Corporation and has now been transferred to the British Westinghouse Company, but, taken as a whole, the municipal orders for German generating plant have been few during the past twelve months, and the gain in this direction is therefore small. It is probable also that, in the aggregate, the municipal orders for new generating plant will be less than usual this autumn, as the new lighting installations will be fewer in number and the power load will not increase at the same rate as during the past few years; manufacturers will largely rest content with their present methods of works driving rather than incur fresh capital expenditure. One may reasonably expect, it is true, that a fair number of new works will be established and new ones extended to take up manufactures in various trades which have hitherto been largely in German hands, but although the electrical installations for these will certainly entail the purchase of electric motors, &c., during the next few months, the actual load will probably not be sufficient to counteract the drop due to other causes until after the winter peak is over, so that it will not require the immediate erection of additional generating plant in the stations. There are, fortunately, some exceptions, however, notably that of Manchester, the building of whose new electricity works should shortly be commenced; meantime, as will be seen in another column, the electricity committee has just received sanction for a loan of £67,400, £29,400 of which is allocated to extensions at the Stuart Street power house, and the remainder is for sub-stations and the purchase of motors for hire.

Motors and generating plant for independent generating stations should shortly be in considerable demand, and, in fact, we believe that several useful orders are being placed already to meet unfulfilled orders placed with German firms or their agents before the war. In this connection we make no excuse for returning to the detailed figures for Germany's exports of electrical machinery during last year, which we published in our issue of August 13th. No less than 183,842 motors and generators were exported from Germany during 1913. Of these, on a rough estimate, between 14,000 and 15,000 were sent to Great Britain, the majority being motors of small and medium size. A big diminution in the country's requirements will still mean a large number of extra orders for British manufacturers. But this is not all, the article from which we quote shows that there will be good markets in British South Africa, Russia, Belgium, Scandinavia, Spain, Japan, China, and South America in which Germany has

hitherto delivered largely. In Australia there is also a growing market in which German competition has developed to a considerable extent comparatively recently.

For some reason, whether on account of price or experience, a German company has been particularly successful in the electrical equipment of mines in this country. Several British firms have, of course, also specialised in this class of plant, and others are certainly in a position to do so. The principle of the explosion-proof motor is now well understood and its design is not difficult; moreover, it must not be forgotten that a very large proportion of the electrical machinery and apparatus for mines is required on the surface or in positions where explosion-proof apparatus is not specified. Coal-mining continues with unabated vigour, and this field is worth cultivating.

Having referred to some of the directions in which increased business may be sought, to make up for the inevitable diminution due to the general industrial position, we may refer to some of the difficulties with which manufacturers of dynamos and motors have to contend. These are practically the same as those of all other manufacturers at present. Money is not changing hands as it does when trade is good; and also the part of the raw material which has to be imported has, of course, been held back in numbers of cases. The raw material for the electrical manufacturer—iron and steel, wire and cable, &c., is, for the greater part, not directly imported—although much of the raw material from which this is made is necessarily of foreign origin. Under present conditions the importer or supplier of this material demands cash payments, and the result is that cash payments are asked from the dynamo and motor manufacturer as well, and the position is temporarily one which discourages the manufacturer from seeking fresh orders. This is already improving, however, and it cannot be long before the conditions are normal. A slight difficulty with which the dynamo and motor manufacturer has to contend is that he has been in the habit of buying some of his insulating materials and some other small parts from abroad—in most cases probably indirectly, through agents in England. This is, however, a small matter which will also adjust itself; all this stuff can be manufactured here. Lastly, there is the fact that large numbers of workmen and members of the staff have left to "join." That the proportion in some cases is large is a matter for congratulation, but it is no reason for a slackening of speed in the order-getting department. One already hears of some works being run at reduced time, so, for the present, there are workmen enough. Until every man who should join the colours has done so, and every man remaining at home is employed and working on overtime, no effort should be spared to keep works going at their maximum speed of production. The increase of trade after the war will again give employment to those who come back after serving their country as well as to those who have filled their places during their absence.

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**Electrolytic Lightning Arresters.**—In a Paper read before the American Institute of Electrical Engineers, Mr. E. E. F. Creighton discussed the status of the aluminium cell lightning arrester. Dr. Steinmetz contributed some valuable information regarding the form of wave front of a lightning surge. The chief point brought out by the Paper and the discussion was that we do not at present clearly understand the nature of lightning flashes, and therefore cannot yet design an arrester which will be efficient in all circumstances. There are definite limits both to the rate of maximum current discharge and of energy absorption for any arrester, and if these are exceeded, damage will result.

\* Previous articles, "Germany's £14,500 Export Trade Analysed," "An Appeal to Manufacturers," "The Effect of the War on the Electric Lamp Industry," "Effect of the War on Street Lighting," and "Openings for the Extension of our Electrical Export Trade" appeared in our issues of August 13th, 20th and 27th, and September 3rd.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,408.

It is desired to run two rotary-converters in parallel from an A.C. generator with a single winding. An essential part of the scheme being that each rotary can be started or stopped independently of the other. As part of the generator output is required for transmission purposes, two separate windings, one for each rotary, cannot be considered. The D.C. output is required for lighting or traction. Would it be necessary to use a transformer or reactance with one rotary, or would it be possible to run the rotaries in parallel on both A.C. and D.C. ends? If the latter scheme is undesirable, as seems to be the case, what are the reasons?—"ROTARY."

(Replies must be received not later than first post Thursday, September 17th.)

### ANSWERS TO No. 1,406.

Several D.C. compound-wound, 230-volt generators varying in size from 250 to 750 kw., run in parallel on the bus-bars to supply works' load, all series windings being connected to an equaliser bus-bar. There is a shortage of power, and it is desired to make use of a 1,150 kw. 460 volt compound-wound interpole generator. Could this machine be made to run in parallel on the 230-volt bus-bars, and if so, what current can be taken from it. State what alteration, if any, will have to be made.—DOUBTFUL.

The first award (10s.) is given to "ASTATIC," who writes as follows:—

It is not an infrequent practice to run generators at half their normal voltage in parallel with other generators of this voltage. Fig. 1 is a diagrammatic sketch of a four-pole, short-shunt, compound-wound interpole generator connected to an equalising bar. In this sketch *A* is an ammeter, *V* a voltmeter, *ES* the equalising switch, *MS* the main switch, and *R* is the shunt rheostat. The series and interpole coils are indicated by large and small circles respectively, the polarity of each coil is shown, and the shunt circuit is indicated by the dotted lines. It will be noticed that two series coils are in series with two interpole coils, and that these four coils are in parallel with the remaining four coils. This is a method adopted in the design of large multipolar generators, the object being to reduce the drop of voltage in these coils to a minimum. We will suppose that this generator meets the details in "Doubtful's" question, i.e., it is 460 volts with a capacity of 1150-kw. or 2,500 amperes.

In desiring to run this generator at 230 volts we must not lose sight of the fact that we cannot with safety take more than 2,500 amperes from the armature, and to take this amount of current it is necessary that the fields should be equally as strong as though the machine was generating 460 volts.

From this it is apparent that the case cannot be met by reducing the speed of the dynamo engine to generate 230 volts, because the current through the shunt fields would only be half the normal quantity. The result is that the field strength would be reduced by half, the field distortion would

be very great, and although an interpole generator, the brushes would have to be continually moved to pick up the neutral position with each variation of the load.

It is therefore obvious that if the field strength is to

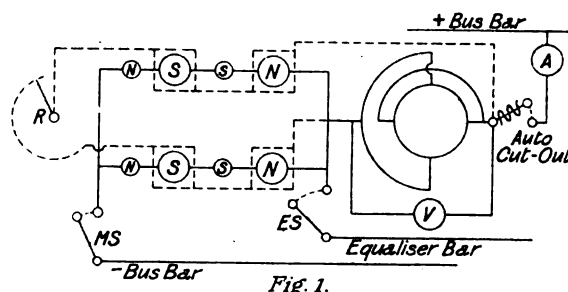


Fig. 1.

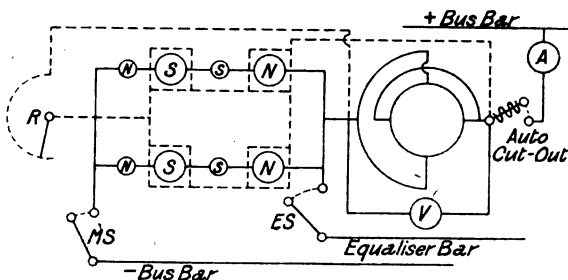


Fig. 2.

remain constant, alterations have to be made to the shunt winding, and this is done in the manner shown in Fig. 2.

In this diagram the shunt winding is shown in two halves, and the two halves are connected in parallel across the armature terminals. From this it will be seen that if the generator is run up to 230 volts, the shunt field will be up to its normal strength, and the only thing necessary is to increase the carrying capacity of the shunt regulator, as it will now be carrying twice its normal current.

The machine may now be placed in parallel with the other machines in the following manner:—Run the dynamo engine up to 70 per cent. of its ordinary speed, and adjust the shunt regulator until the voltmeter indicates a voltage slightly below the voltage of the machines under load. Then close the equaliser switch, then the main switches, and adjust the shunt regulator until the machine is taking its share of the load. The disadvantage of using machines in this manner is that the output of the machine in kilowatts is reduced by half. It is a much better policy, where it is possible, to run the machine at its full voltage, and connect up the load on a three-wire system.

The second award (5s.) is made to "R. W. J." for the following reply:—

There is no simple and efficient method of converting the 460-volt machine to supply the 230-volt bus-bars direct. Theoretically it could be done by (a) weakening the field by inserting resistance, but sparking and bad regulation would result from working on the unsaturated and unstable portion

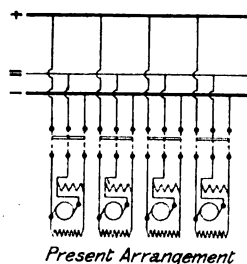


Fig. 3.

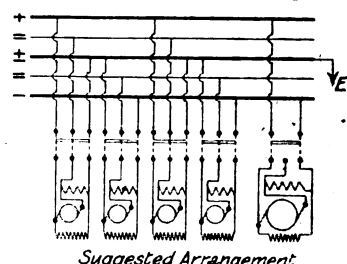


Fig. 4.

of the magnetisation curve; (b) reducing the speed of the generator. This again produces bad commutation owing to the altered frequency of the same, not to mention difficulties of engine governing and bad efficiency through conditions other than those for which the machine is designed. Alteration of armature conductors is not simple, and therefore assumed out of the question. Even if the armature were re-wound, the two halves of the field put in parallel and any other arrangement made for generating at 230 volts the machine would only give half-load, since brushes, commutator, &c., would only carry the same current (2,500 amps) as at

460 volts; therefore, the efficiency of both generator and engine would be low.

If the 460-volt machine is on hand, or circumstances make it sufficiently desirable to use it, the best way would be to convert the system to three-wire, with 230-volt machines on the inners and the 460-volt across the outers, thus allowing all machines to work normally. In addition to the usual advantages of three-wire distribution, the conditions are very favourable, since a works load allows of convenient grouping and balancing by means of the present sets.

The greater portion of the present installation may need no alteration if the extensions can be balanced against it. Reference to the general diagram shows a new equaliser bar,

and also an earthed neutral bar, which may, of course, be smaller than the main bars.

By adjusting the compounding of the various machines a wide range of regulation and operation can be obtained, and although the foregoing is merely an outline, the advantages and possibilities of the scheme are obvious.

#### ANSWERS TO No. 1,405.

Mr. F. R. C. Rouse writes objecting to "M.'s" reply to this question, to which the second award was given. We admit that "M.'s" solution is not correct,—in fact he practically admitted it himself,—but it had the merit of being a good attempt and interesting. "F. R. C. R.'s" answer, to which the first award was given, was correct.

## THE ELECTRICAL EQUIPMENT OF AN UP-TO-DATE CINEMA THEATRE

A FINE example of an up-to-date cinema equipment is to be found in the two theatres which constitute the establishment known as the "Blue Hall," King Street, Hammersmith. The original Blue Hall, which has a seating capacity of 1,300, was opened in December, 1912, and is provided with its own suction gas-driven generating plant. Its success was so great that in order to relieve overcrowding another even larger hall (seating 1,700) was soon afterwards built at the back. Owing to the position of the engine-room precluding extensions of plant, and to the short time that was available (for the new hall was built and opened complete in three months) it was not practicable to have an independent source of supply, so that in this case current is taken from the mains of the Hammersmith Borough Council. Thus the whole establishment is of considerable engineering interest, embodying, as it does, arrangements for making use of independent and outside supply. It is not possible to make a reliable comparison of costs between the two methods, as the load-factor of the two halls is very different, the newer one taking only the "peak" of the business in the evening, while the older hall is open a much larger part of the day. There is no harm in remarking, however, that the proprietors express themselves quite satisfied with their own generating plant on the score of economy. As the engines are independent of the town gas supply, it is possible to use gas from the ordinary low-pressure mains as a stand-by for auditorium lighting, &c., while for a stand-by for some of the external arc lighting, high-pressure gas coming from an entirely different gas-works is used.

The engine-room supplying the original hall is in the rear of these premises, between them and the front of the new hall, and, as will be seen, great and successful precautions have been taken to avoid nuisance from noise, smell, or vibration; a very important matter in a residential neighbourhood. There are two continuous-current A.E.G. dynamos, each being driven by a "National" gas-engine. One is rated at 176 amperes and the other at 265 amperes at 110 volts. As a general rule the smaller machine supplies the projectors and auditorium lights during the daytime, and the large set is started up in the evening for the outside arcs, signs, and decorative lighting. In the event of a breakdown to one machine, the exterior lighting is cut down, when even the smaller machine can keep the projectors and the necessary lighting going. Such a contingency has, however, not yet arisen, and during the time the plant has been running it has not been found necessary to rely upon one machine. The sets are not run in parallel, but each has its own bus-bar on the switchboard, to which any of the following four circuits can be connected by double-throw change-over switches: projectors, inside lighting, outside arcs and decorative lighting, signs. The normal load with the usual lights on amounts to about 150 amperes for the small machine and 200 amperes for the larger one. In view of the limited nature of the attendance, this separate circuit arrangement was considered more advisable than parallel running. The engine-room contains the distributing board for the outside arc circuits, as well as the main board. These arcs are mostly along the roadway leading to the new hall, which is brilliantly illuminated by flame arcs on street-lighting posts. The "National" gas producer is in a room adjoining the engine-room, and is in a single unit for both engines. Anthracite fuel is used, and there is absolutely no smell in the producer room. Particular care has been taken in the silencing of the exhaust of the engines. Six pits are provided, three for each engine, and the gas passes through specially-arranged perforated metal plates and shingle ballast. This form of silencer, which is very efficient, was designed specially

for the job. In order to preclude further all possibility of annoyance from the plant, a deodorising equipment is provided for the effluent from the gas producer, which is passed into a large tank, where it is thoroughly mixed with a permanganate of potash solution, and as an additional precaution is only passed into the drains at night. Vibration is minimised by the mounting of both engines on "Mascolite" anti-vibration foundations. The result of all these precautions is that it is impossible to tell, when in the main or adjoining buildings, whether the plant is running or not.

From the engine-room cables are taken to the intake chamber of the older hall, where D.P. switches are provided for all four circuits with ironclad fuses. The whole of the switches for the auditorium lights are also in this chamber, an arrangement distinctly preferable to the use of secret switches about the auditorium itself. Some of the outside lighting is also controlled from this point, including signs and decorative lighting. The excellent precaution is taken of providing an emergency switch short-circuiting the entire interior lighting distribution board, so that the auditorium can be flooded with light instantly when required.

The main illumination of the auditorium is by indirect cornice lighting, giving a very restful effect, and as this is always turned up gradually through a dimmer, all shock to the eyes is avoided when the lights are put on between pictures. The lamps are of the metal-filament tubular pattern in porcelain trough fittings which plug together to form a continuous strip not requiring any wiring. Each unit of 25 c.p. is 9 in. in length, and there are in all more than 500 lamps. The side lighting, which is always on, is in special shaded fittings, throwing light practically only on the floor, and is alternately gas and electric, the fittings being made as much alike as possible. There are on each side of the proscenium, in addition to the number signs, electric clocks with dials illuminated from the back, which are lit up at the same time as the main lighting between pictures. These are part of a set of "Synchronome" clocks, controlled by a master controlling clock in the vestibule. It may be mentioned here that all the external wiring is in substantial galvanised pipes, and that screwed barrel conduit of the best class is employed for all interior wiring.

The operating box above the gallery at the back is spacious, cool, and airy, and contains a pair of "Simplex" cinematograph projectors and a slide lantern. Hand-regulated arcs, taking 50 to 60 amperes are used, and the film mechanism is driven by small electric motors. A switch panel contains the change-over switch putting one or other projector in action and other necessary gear. The regulating and steady-ing resistances are behind this board. The dimmer for the main lighting, which is of the metallic type, is also placed in the operating box, and a switch is provided by which this can be short-circuited if required. The ventilation of the hall is taken care of by a pair of 48-in. Blackmann electric fans.

The new hall, which is of rather larger size than the older one, takes its supply, as has already been remarked, from the single-phase mains of the Hammersmith Borough Council. This is converted to continuous-current for the projectors by motor-generators in the intake room. Two of these are installed, only one of which is used at a time, while the other forms a stand-by. Each set consists of a continuous-current A.E.G. dynamo rated at 125 amperes, driven by a slip-ring type induction motor. The sets are mounted on "Mascolite" anti-vibration foundations, and the bed-plates are not bolted down in any way. The starting board is equipped with drum-type starters, and change-over switches put one or other of the generators on to the projector circuit. In the same



chamber are placed the main intake ironclad switches and fuses, meters, &c., and the main distributing board for the interior lighting, which is, of course, taken direct off the main. This consists of a collection of ironclad switches and fuses mounted on a teak board. The lighting circuits are further sub-divided in another brick distributing chamber, where a fuse-board of the ordinary type is provided. The auditorium is similar to that in the older hall, as regards the cornice lighting and alternate gas and electric masked side lights, but there is in addition an extremely handsome semi-indirect corona fitting suspended in the centre of the ceiling, with sixty lamps throwing practically all their light up to the ceiling and most effective blue glass illuminated panels all round. This fitting was specially designed and made for the Blue Hall, and is a remarkably fine piece of work. A similar arrangement of illuminated clock dials is employed as at the other hall.

The equipment of the operating box is generally similar to that in the older hall, with two "Simplex" cinematograph projectors and one slide lantern. Practically the only difference, apart from the smaller resistances required, on account of the lower voltage of the projector circuits, is the improved form of dimmer employed. The switch arm of this is connected by a toggle joint arrangement of levers to a dash-pot in such a way that once past the dead centre a spring advances the arm slowly against the dash-pot and cuts out the resistance automatically. A single pull on a rope alongside any projector gives the initial movement, and the rate at which the resistance is cut out does not depend on the operator. Two 48-in. fans, similar to those in the older hall, are used, and the method of control is interesting. The London County Council regulations require that the starters must be within sight of the fans. Now, as it is inconvenient to send up to the roof every time the speed of the fans is to be regulated, a regulating rheostat is installed in the distributing chamber on the ground floor for each fan in series with the ordinary starters near the fans. By this means, when it is required to diminish the air current, the fans can be brought down to a very slow speed from downstairs. There is an "off" position on each regulator by which the fans can be stopped, but they cannot be started again, except from upstairs, owing to the action of the no-voltage release on the actual starters. All important points are connected together by Sterling inter-communication telephones. It is perhaps unnecessary to describe in detail the external lighting. Not only is there a liberal supply of flame-arc lamps, but there is some most effectively arranged decorative lighting and signs employing some 2,000 incandescent lamps, which draw attention in suitable and successful manner to this excellently equipped establishment.

In conclusion, we wish to express our thanks to Mr. James W. Barber, Consulting Engineer to the proprietors, who was responsible for the electrical arrangements, and personally explained the equipment to our representative.

### ELECTRIC TRACTION NOTES

A new Report (No. 68) has just been issued by the Engineering Standards Committee dealing with the "Method of Specifying Resistance of Steel Conductor Rails." As is pointed out in the Preface by Dr. R. T. Glazebrook, this Report will have considerable value inasmuch as it will help to remove ambiguity from specifications for work or materials, and thereby reduce both the cost of preparing tenders and the possibilities of dispute. The method selected by the Committee is to define the standard dimension in terms of length and weight per yard. The resistance of a steel conductor rail is to be expressed as the resistance in microhms at a temperature of 60° F. of a rail of the same material as the conductor rail in question, having a length of 1 yd. and a weight of 100 lb. The method of reducing observations made at temperatures other than 60° F. to the equivalent readings at that temperature is fully set forth, and tables of reduction factors to facilitate this are included. An Appendix contains reduction formulæ, so that previous values for the resistance of rails in terms of copper may be readily reduced to values in terms of the recommended standard.

The Revised Regulations and Bye-laws as regards electrical power on the London County Council Tramways have just been issued by the Board of Trade. In addition to some alterations of purely local interest, the following innovations of general interest may be noted. The use of a slot-rail "grip" brake has been made compulsory for cars working

over the High Street and Highgate Hill section of the line. The slipper brake, or other track brake, must be applied to all carriages travelling on falling gradients of 1 in 15 or steeper. The use of trailer carriages, which had previously been restricted to the conveyance of stores and sand to and from the depôts and the removal of disabled carriages, is now permissible on certain portions of the tramways for the conveyance of passengers, on such terms and conditions as may be approved by the Board of Trade, in accordance with the L.C.C. (Tramways and Improvements) Act, 1912.

The amount to be transferred to relief of rates from tramway profits at Sheffield for the year 1913-14 is £30,581, a record sum, and £2,081 more than the estimate. Before allocating this amount, however, the Tramways Committee has set aside £30,123 to renewals fund and £2,000 for a special purposes fund. At Newcastle the sum of £12,000 is to be transferred to relief of rates and £25,000 carried to appropriation account.

Mr. H. E. Ellis, Borough Electrical Engineer at South Shields, is preparing a special report on electric vehicles.

The Aberdeen Electricity Committee recommends that electrical energy be sold to the Tramways Department at 0.85d. per unit for the first 2,000,000 units, and 0.80d. per unit for subsequent units. This arrangement is to continue for five years.

The result of the year's trading to June 30th of the United Electric Car Co., Ltd., was an available balance of £14,654. A 5 per cent. dividend is recommended on the ordinary shares, £2,000 is added to reserve, and the balance of £2,154 carried forward.

**Telegraph Notes.**—The British Pacific cable between Bamfield (Vancouver) and the Island of Fanning has been cut, presumably by the German cruiser *Nürnberg*.—The Swedish and Danish Administrations have applied Article 8 of the Telegraph Convention, and the Swiss Government has prohibited telegrams to post or telegraph restante.—The Ottoman Government declines any responsibility or liability in connection with telegrams.

**The B.T.H. Co. and the War.**—The members of the staff and works of the British Thomson-Houston Co. are answering the call of their country in a whole-hearted manner. So keen is the patriotism of their employees that approximately 900 have answered the call. This represents over 50 per cent. of the eligible male adult employees. It is the company's intention to pay half wages to those of its employees who have enlisted, and wherever possible to reinstate returning employees in their former position on the cessation of hostilities. In those positions where fresh help has to be employed to keep the works going, no male candidates will be considered who are not over thirty-five years of age or who cannot give proof by showing H.M.S. certificate that they are medically unfit to enlist. Reserve and Territorial officers on the staff of the company have rejoined their respective units in the Navy, Lancashire Fusiliers, and the King's Horse, and it is noteworthy that one of the officers not being able to obtain his former commission has volunteered as a gunner in a Howitzer battery. Lord Kitchener has sent a letter through Major-General Rawlinson to the managing director expressing his appreciation of the company's attitude.

**Siemens Bros. & Co. and the War.**—More than 200 men employed by Siemens Bros. & Co. are now with the Colours, and, in addition to keeping all situations open, the firm is paying full wages to married men and half to single men. The cost to the firm is some £150 per week.

**The British Westinghouse Co. and the War.**—This Company has announced to its employees its desire that as many of them as possible should join the forces, and in order to provide for the welfare of dependents a substantial fund has been set aside. In addition, employment will be found for all those enlisting in the same or similar positions at the conclusion of the war.

**Special Constables.**—The full staff of the Marylebone Borough Council Electricity Department has been sworn in as special constables.

**The Manchester Engineers' Club Battalion.**—At an extraordinary general meeting of the Club members, held on Tuesday, it was decided to form a "Pals" battalion for Kitchener's Army, to be recruited from those engaged in the works and offices of engineering concerns. A special committee was appointed, consisting of Messrs. Daniel Adamson, H. T. Wilkinson, J. H. Stubbs, E. Simon, S. L. Pearce, G. Hughes, W. T. Anderson, E. T. Morland Johnson, E. L. Hill, and Colonel Hollingworth. Every member of the Club is asked to induce his friends, staff, and employees to join, and to send their names as quickly as possible to E. L. Hill, Esq., The Engineers' Club, Albert Square, Manchester, with the following particulars:—Name in full; age; address; married or single; if married, number of children under 16 years of age; occupation; name of employer; previous training, if any, in the Forces of the Crown.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**THE "SAVING" LIGHT.**—We have received from the Edison & Swan Co., Ltd. (Ponders End, Middlesex), their latest production in advertising postcards. The design is entitled "The 'Saving' Light," and shows in the background a ship in distress, in the act of sending up a rocket signal. After describing a parabolic path, the rocket has burst and revealed the "Saving" light, in the shape of an Edison drawn-wire lamp. The company will be glad to send supplies of these cards upon application.

**FLOAT SWITCHES.**—A new list from the British Thomson-Houston Co. (Rugby and London), deals with their latest design of float switches, which are intended for use with motor-driven pumps, when it is desired to maintain a predetermined level of water in a tank or to limit the travel of the ram of a hydraulic accumulator. In the case of small power motors, these switches can be inserted in the main circuit, but for larger powers they are arranged to control the actuating coil circuit of an automatic starting rheostat. The switch is usually mounted on a wall adjacent to the tank containing the head of water to be controlled, and is operated from a copper float, through a chain and lever. In the case of a hydraulic accumulator, the chain and float are replaced by a rod which is attached to some moving part of the accumulator. Either alternating or direct current motors can be controlled by these switches.

**BELLS AND SYRENS.**—In a list recently issued by the Sterling Telephone & Electric Co. (210-212 Tottenham Court Road, W.) a large range of electrically driven bells and syrens are described. All the patterns are very substantially made, and have been designed to suit a variety of purposes, including tramway work, mine signalling, and for use in works and factories. Fire alarm apparatus and accessories are also dealt with.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**SHIP CLEANING APPARATUS.**—We are informed by the Submarine Motor Ship Cleaner Co. that the Admiralty have recently adopted their apparatus for removing the growths from the outsides of ships without the necessity of dry docking. This apparatus was fully described in an article in our issue of December 11th, 1913, page 705, and consists essentially of a water-tight motor driving a rotary brush. The pressure against the ship's side is maintained by a propeller in the back portion of the apparatus. A descriptive leaflet has been issued.

**MINE SIGNAL INDICATOR.**—Apropos of the recent regulations relating to mine signalling, Siemens Bros. & Co., Ltd. (Woolwich, London, S.E.), have introduced a new type of their Mine Signal Indicator, which automatically indicates the nature of the signal by means of a pointer moving over the face of the dial to the order given. A short article in our issue of October 2nd, 1913, gives some particulars of the way in which this operates.

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Bacup.**—The contract of Chas. Macintosh & Co. has been accepted for distributing mains.

**Manchester.**—A contract has been placed with the Mirrlees Watson Co. for the condensing plant for the new turbo-alternator recently ordered for Stuart Street station. The tender of W. T. Glover & Co. has also been accepted for cable. Other contracts recently given out by the Electricity Committee are as follows:—Carbon brushes, Le Carbone and Morgan Crucible Co.; flexible conductors, Chas. Macintosh & Co.; insulated wires, Liverpool Electric Cable Co.; binding and fuse wires, India-Rubber, Gutta-Percha Co.; fuse boxes, British Insulated & Helsby Cables, Ltd.; motors, Siemens Bros. Dynamo Works, Ltd., Electric Construction Co., Electromotors, Ltd., British Westinghouse Co., and E. Brooks; motor starters, Verity's, Ltd., Ferranti, Ltd., and G. Ellison; meters, Ferranti, Ltd., and Chamberlain & Hookham; incandescent lamps (metal filament), British Thomson-Houston

Co.; carbon-filament and radiator lamps, Siemens Bros. Dynamo Works, Ltd.; current and potential transformers, Ferranti, Ltd.

**Rotherham.**—A tender for meters has been placed with Chamberlain & Hookham.

A tender for 2½- and 5-ampere meters has also been placed with the Bastian Meter Co.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although no official quotation is obtainable, the price of copper may be taken as from £59 to £60.

**Siemens Bros. Dynamo Works.**—Mr. C. Koettgen has tendered his resignation, which has been accepted, as a Director and as Managing Director of Siemens Bros. Dynamo Works, Ltd., and has no further connection with the Company.

**Bastian Meter Co.**—We are advised by the Bastian Meter Co., Ltd. (Bartholomew Works, Kentish Town, N.W.), that they hold large stocks of raw materials, and that they anticipate no trouble or delay in fulfilling all orders. The Bastian meter is manufactured throughout in England with British labour and British capital.

**Morley-Fricker Electricity Meter Co.**—The shareholders have passed a special resolution transferring the business of the company to the British Insulated & Helsby Cables, Ltd., for the sum of £8,500. The company is to be wound up voluntarily, and Mr. F. Miller, of 82 Victoria Street, is liquidator.

### APPOINTMENTS AND PERSONAL NOTES

Mr. Harvey Gooch, of Drake & Gorham, Ltd., has joined the Cameron Highlanders, and asks us to state that, owing to the short notice, he has been unable to say good-bye personally to all of his friends in the electrical industry.

An electrical engineer to take charge of train-lighting installations and the electric driving of locomotive shops is required by the South Indian Railway Co. Application to R. White, Consulting Engineer, 3 Victoria Street, London.

A temporary engineer in charge of the meter department is required by the Hammersmith Electricity Department. (See an advertisement on another page.)

A junior switchboard attendant is required at Swansea. Salary £70 rising to £100 per annum. (See an advertisement on another page.)

**Importation of Catalogues to South Africa.**—An alteration has been made in the South African Imports Tariff relating to catalogues or price lists of foreign firms addressed to importers, merchants, or manufacturers. Previously a 25 per cent. *ad valorem* duty or 2d. per lb., whichever is the higher, with a rebate to British goods of 3 per cent. has been charged, but in future these will be admitted duty free. This alteration in the law of the Union of South Africa was initiated by the British Electrical and Allied Manufacturers' Association and effected through the instrumentality of Sir R. Sothorn Holland, H.M. Trade Commissioner, Cape Town.

**Exhaust Steam Plant at a Coventry Colliery.**—In connection with this article in our last issue, describing the plant at the Coventry Colliery of the Warwickshire Coal Co., Messrs. Willans & Robinson, Ltd., inform us that they were the main contractors for the complete turbo-generators and condensing plant, and that the General Electric Co. were sub-contractors to them for the supply of the alternators. We much regret that this important fact should have been omitted by the correspondents who sent us the article.

**Dispute as to Ownership of Carbons.**—With reference to the note on this subject on page 489 of our last issue, the Beck Engineering Co. in the High Court on September 2nd applied to continue an Order obtained *ex parte* restraining the Foster Engineering Co., Ltd., their servants and agents until after Wednesday, September 2nd, from parting with or dealing in any way with the ten thousand Beck flame carbons which are the subject of the dispute. Mr. Justice Shearman, however, after hearing both parties, refused the application and discharged the Order already made.

## THE LEMINGTON LAMP BULB FACTORY

THE outbreak of war has brought into prominence the dependence of many industries and undertakings upon supplies from the Continent. It has also made conspicuous—though in a much happier way—those enterprises whose products have been wholly manufactured in Great Britain. Owing to the prevalence and persistence of foreign importation, it has been very difficult in many cases to maintain the policy of all-British manufacture. The companies which did this, in spite of the tidal waves of Continental competition, are now reaping the well-deserved reward.

Glass plays a very important part in electrical apparatus; it is an obvious essential in electric incandescent lamps, which



FIG. 1.—GENERAL VIEW OF THE WORKS, SHOWING THE "CONES" OR GLASS HOUSES.

are now produced in millions every year. For various reasons most makers of electric lamps in Great Britain have imported the bulbs from Germany or Austria, and have disregarded, as remote, any danger which this reliance upon foreign glassworks might entail.

Ten years ago, however, the General Electric Co. took steps to secure an independent British supply of lamp-bulbs, and after a careful survey of the situation it decided to acquire glassworks of its own. An opportunity presented itself in connection with glassworks at Lemington, Newcastle-on-Tyne. In taking over these works the General Electric Co. formed a subsidiary company, the Lemington Glassworks, Ltd., in which it holds a controlling interest. At the time

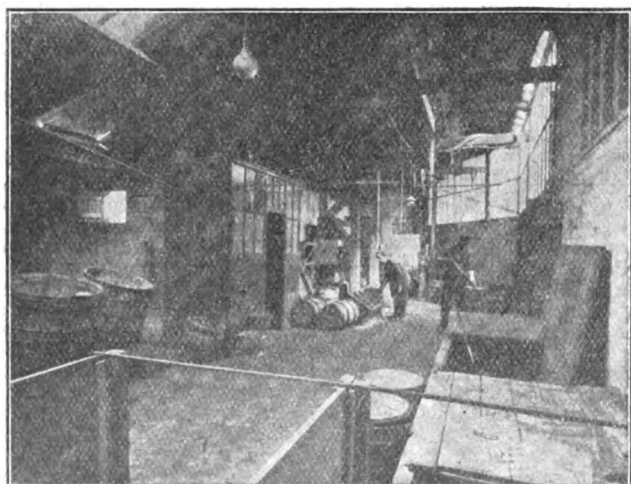


FIG. 2.—THE MIXING HOUSE.

of purchase the works possessed two glass-houses, but the equipment has been gradually extended until the number of glass-houses reached six. This development, we are informed, was not achieved without many difficulties. Glass-blowing is a highly skilled trade, and the Company found it necessary to train the labour it required for the special work of blowing the various bulbs required for incandescent lamps. This process occupied a considerable amount of time, and demanded an expenditure which appeared at the time to be

burdensome, in view of the continued importation of large quantities of bulbs at low prices. But in the face of all the difficulties the works grew steadily, and they are now giving continuous employment to about 250 workpeople.

The main purpose of the works has been, of course, to supply bulbs to the Robertson Lamp Works (and later on the Osram Lamp Works), but we understand that the G.E.C. does not hesitate to go to the assistance of other electric lamp makers in this country. On several occasions, they tell us, when there has been a shortage of importation from the Continent, there would have been a serious famine in bulbs if the supply had not been available from the Lemington Glassworks. In the present critical state of things, with importation absolutely stopped, the G.E.C. has decided to continue this broad-minded policy. So far as the capacity of the works will permit—and subject, of course, to the demands of the Government—the needs of all electric lamp makers will be met. Moreover, arrangements are being made to extend the works as rapidly as possible. It is estimated

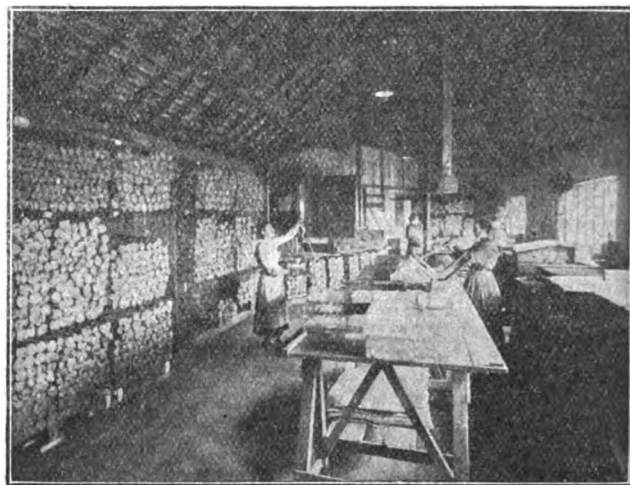


FIG. 3.—THE TUBE SHOP.

that the cessation of the foreign importation of glass offers an opportunity for the employment of from four to five times the number of people at present engaged in this section of the British glass industry.

A specific instance of the value of the works during the war crisis may be mentioned here. Soon after the outbreak of hostilities an urgent Government order was received by the Robertson Lamp Works for a special type of electric lamp. The glass for this type had previously been obtained from the Continent, but the Lemington Glass Works were able to produce the necessary bulbs so quickly that within three days of the receipt of the order complete samples of the lamps were in the hands of the Government Department concerned. These samples were approved, and the order to manufacture in quantities was at once put in hand. Even under normal conditions, the execution of such an order would have occupied six weeks if Continental sources had been chosen.

The accompanying pictures of the Lemington Glass Works are from photographs taken at the end of last month.

We are asked to add that the Lemington Glass Works are open to inspection by anyone who is sufficiently interested to write for permission to visit them. Inquiries should be addressed to Chris. Wilson, Esq., Brook Green Works, Hammersmith, W.

**"London Fair and Market."**—An exhibition bearing this name is being promoted by the International Trade Exhibition, Ltd. (Broad Street House, New Broad Street), who, it will be remembered, were organisers of the last two Electrical Exhibitions at Manchester and Olympia (London) respectively. The date will be March or April, 1916, the exhibition will be at the Agricultural Hall, and will be exclusively for manufacturers and wholesale houses (no German or Austrian goods admitted), and the whole of the gate money will be handed over to one of the existing public funds for the benefit of the dependants of soldiers and sailors who have fallen in the war.

**Competition with German and Austrian Trade.**—The Commercial Intelligence Branch of the Board of Trade at 73 Basinghall Street, E.C., ask us to announce again that they are desirous of hearing from firms who are prepared to send to them samples or catalogues of German and Austrian or Hungarian goods which have competed with British products at home or abroad.

## ELECTRICITY IN CIDER MILLS

THE arguments in favour of the adoption of electric drive in breweries apply with even greater force to cider making, since the large quantities of steam required for heating purposes in the manufacture of malt liquors are not needed by cider makers, while much of the machinery used is of the same type in the two cases.

An interesting, and at the same time very unusual, installation is in operation at Messrs. Goodwin & Co.'s Cider Mills, Hereford. For the purpose of extracting the juice from the

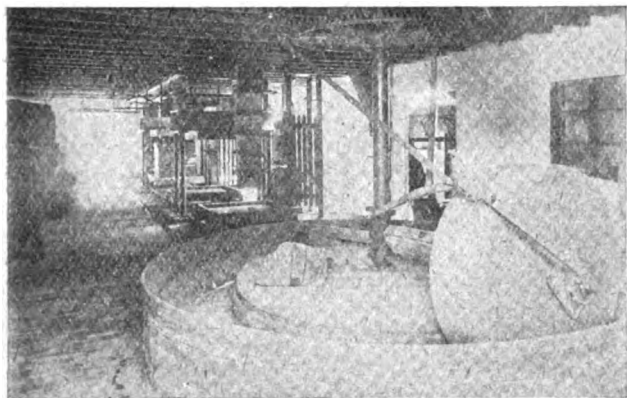


FIG. 1.—200-YEAR-OLD STONE CIDER MILL AND HYDRAULIC PRESSES DRIVEN BY B.T.H. MOTORS.

fruit, two hydraulic presses and an old stone mill are employed, the latter, which is over 200 years old, consisting of a massive stone roller revolving in a circular trough, also of stone, in which the apples are placed. This mill is driven by the B.T.H. electric motor shown, which also drives the pumps used in connection with the hydraulic presses, which can be seen in the background on Fig. 1, to the left of the old stone mill. This is believed to be the only example of an old stone cider mill still in use in the County of Herefordshire, and in any case the combination of this

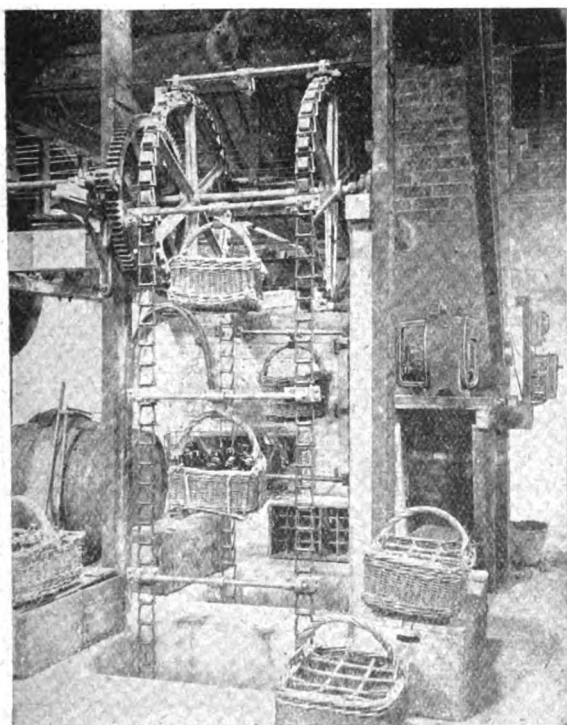


FIG. 2.—HOIST IN CIDER MILL DRIVEN BY B.T.H. MOTOR.

200-year-old mill with a modern electric motor is certainly unique. The electric drive is also used at these works in connection with bottling and corking machines, aerating machines, &c.

Another Hereford cider mill which is electrically equipped is that of Messrs. H. P. Bulmer & Co., where, in addition to the advantages which always result from the introduction

of electric power, a remarkable saving of time has been effected by its means in connection with the emptying of the vats. The cider is fermented in huge vats, composed entirely of English oak, having a capacity of 50,000 gallons each. Before the adoption of electric power it was necessary to wait for a period of from two to three days after the removal of the fermented juice before the fumes had dispersed sufficiently to allow the men to enter the vats for the purpose of cleaning them. At the present time a small electrically-driven exhaust fan mounted on the top of each vat entirely removes the fumes in about a quarter of an hour. After fermentation the cider is bottled and corked, the bottles being then conveyed by means of the electrically-operated hoist, shown in Fig. 2, to the cellars where they are stored.

## CORRESPONDENCE

**The Varley Magnet Co., Ltd.**—Mr. C. Oliver, one of the Managing Directors, writes that an absolutely false report has been spread with regard to his firm. This report, which he has reason to attribute to a German competitor, states that the Company are dependent on Germany for their supply of raw material, and are unable to deliver their manufactured goods. In emphatically denying this, Mr. Oliver informs us that, as his Company use British raw materials in their manufactures, their business is now being carried on uninterruptedly, and is largely enhanced by a bulk of work which before the war came direct to this country from Germany. Their new factory, equipped with the most modern winding plant, is in a position to carry out any orders entrusted to them, and handle with particular energy work which has previously been manufactured outside this country. They are determined that this extra business shall lead to a permanent increase in the employment of British labour. As the coil-winding business in the past has largely been associated with German connections, they desire to emphasise that their Company without exception is English—in capital, directors, managers, clerks, and workpeople.

**The Sun Electrical Co.**—This Company asks us to state that, since its formation, it has been run entirely with English capital, with an English Board, under English management, and with a British staff. The whole of their own specialities and the greater proportion of their factored goods have been British throughout, and this policy will, in the future, be further extended to exclude everything of German manufacture.

**British-made Glassware.**—Mr. H. Hepworth Thompson, of Holophane, Ltd. (12 Carteret Street, Westminster, S.W.), writes us as follows: "In view of the stoppage to the importation of Continental-made glassware, I hope you will permit me to use your columns for the purpose of stating that Holophane is the only form of prismatic glass which is made in this country. Our works at Gateshead are well equipped for dealing with any demands which may be made upon them, and it is not anticipated that any difficulty will arise in regard to supplies of raw material. For these reasons, the prices of Holophane glassware will remain as before."

**War on German Trade.**—Under the *nom de plume*, "Common Sense," the (English) secretary of a company with works in England but with German-owned capital writes us: "As a nation, we have immense sums of money invested abroad, and therefore, on principle, we cannot quarrel with German investments here, especially when they are employed in manufacturing, and therefore have the effect of curtailing the importation of manufactured articles from Germany. The success of an industry (especially a comparatively new industry) depends upon the capital which it is able to attract. The British public have never given any real support to the electrical trade, and, backward as we are, our position would have been a thousand times worse had it not been for the financial support and enterprise of the foreigner. Doubtless there are many manufacturing concerns in England to-day who are supported partly by German capital, which they would be only too pleased to replace with British money if the British capitalist would come forward and divert into his own pockets this pipe line of gold in the form of dividends which, according to the daily Press, has been flowing to Germany. The Patent Act of 1907 was a direct discouragement to the importation of patented articles manufactured in Germany, and a direct encouragement to the employment of German capital in Great Britain, with the result that many articles which were previously imported are now being manufactured in British factories by British labour. If we are now going to turn round and drive foreign capital out, we are simply cutting off our nose to spite our face."



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Bacup.**—A supply of cable is required.

**Clatterbridge.**—Suction gas-driven generating plant and battery for infectious diseases hospital. Clerk, Wirral Joint Hospital Board, 54 Hamilton Street, Birkenhead. September 26th.

**India.**—The Amritsar (Punjab) municipality proposes to borrow £30,000 for an electric lighting scheme.

**Limerick.**—A 160-kw. Diesel oil engine and dynamo, and a motor-driven air-compressor are required. Borough Electrical Engineer. September 18th.

**Manchester.**—Sanction has been received from the L.G.B. for the borrowing of £67,400 for new plant. The amount is made up as follows:—Hired motors, £10,000; sub-stations, £28,000; Stuart Street extensions, £29,400.

**Monmouth.**—A loan of £1,800 for cable extensions is to be applied for.

**Portrush.**—It has been decided to adopt gas engines in preference to Diesel engines in connection with the electric supply scheme.

**Southend.**—A Local Government Board inquiry was held last week regarding an application for sanction to borrow £60,000 for extensions to the electricity undertaking.

**Sunderland.**—A L.G.B. inquiry was held last week concerning a loan of £50,000 for mains, and £13,600 for sub-station machinery and switchgear.

**Torquay.**—Sanction has been given to a loan of £5,000 for mains extensions. An inquiry will be held shortly with regard to a loan of £16,000 for new plant.

**Warrington.**—It is proposed to extend the electric supply mains into the Grappenhall district.

### Wiring

**London:** L.C.C.—215 wiring points at Giffard Street Elementary School, Caledonian Road, N. Chief Engineer. September 28. (See an advertisement on another page.)

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bristol.**—Extensions at Stapleton infirmary.

**Bromley.**—New infirmary.

**Bury.**—Baths, Blackford Bridge.

**Manchester.**—Cinematograph theatre. Architect, H. A. Yearsley.—New works, Royton Street. Architect, S. Moss.—New police station at Irlam.

**Nantwich.**—Grammar school. Architect, H. Beswick, Newgate Street, Chester.

**Pontypridd.**—New fire station.

**Wrexham.**—Public hall and institute. Architects, Dickens, Lewis and Haynes, Shrewsbury.

**York.**—Offices for Weights and Measures Department, Friargate. City Engineer.

### Miscellaneous

**Australia.**—The Kalgoorlie Council requires a 5-ton wagon capable of being used for carrying road metal, for street-watering purposes, &c., at a speed of six miles per hour. The requirements of the Council, it is thought, will probably best be met by the wagon being arranged to haul trailers. Further particulars at 73 Basinghall Street, E.C.

The Deputy Postmaster-General, Brisbane, requires an automatic or semi-automatic switchboard and a common battery multiple switchboard. Further particulars, 73 Basinghall Street, E.C.

**Halifax.**—Three months' supply of electrical fittings for the Guardians. Clerk, Union Offices, Carlton Street.

**London:** St. Pancras.—Electric lift. Town Clerk. September 21st.

**South Africa.**—Ten single-truck double-decked cars are required by the Johannesburg municipality. Further particulars at 73 Basinghall Street, E.C.

**Wolverhampton.**—Twelve months' supply of electrical fittings for the Guardians. Clerk, Poor Law Offices. September 15th.

## LOCAL NOTES

**Aberdeen:** *Considerable Increase in Revenue.*—There was the considerable increase of £4,252 in the revenue of the electricity undertaking last year, compared with the previous twelve months, and a reduction in working expenses of £111. This result has been obtained notwithstanding coal has cost 1s. 4d. per ton more than in 1912-13. After meeting capital charges there was a balance of £4,960, which has been placed to reserve fund. Mr. J. A. Bell, the City Electrical Engineer, concludes his report by stating that under ordinary circumstances he would have proposed a rearrangement of tariffs, but in view of the present unsettled state of trade, which has already affected the output, he recommends that the existing scale of charges remain in force at least for the first six months of 1914-15.

**Bolton:** *New Electricity Works.*—The first generating set at the new Back-o'-th'-Bank electricity works was put into operation on the 3rd inst. The set has a capacity of 5,000 kw. The original plans for the works were got out under the direction of Mr. A. A. Day, when he was Borough Electrical Engineer some eighteen months ago, and they were formally opened last week. The Chairman of the Electricity Committee paid a tribute to the subsequent work done by Mr. W. J. Wood and his staff. The official opening will take place on some later date, and in the meantime further additions will be made to the equipment.

**Bombay:** *Street Lighting.*—The electric supply and gas companies are to carry out experiments in order to decide the comparative merits of gas and electric lighting.

**Malvern:** *Extension of Area.*—A canvass is being carried out in West Malvern in order to assist the Electric Lighting Committee to come to a decision as to a proposal to extend the mains into this district.

**Midhurst:** *Overhead Wires.*—The promoters of the Midhurst Electric Lighting Order, 1914, have approached the Council with regard to the formation of a company to carry the Order into effect, and also asking for permission to erect overhead wires. It is pointed out, however, that the capital cost of underground wires would render the scheme prohibitive, and that the financial success of it depends upon using overhead wires practically throughout the district, with the exception of certain thoroughfares in Midhurst. The necessary permission has been given.

**St. Anne's-on-Sea:** *Electricity Accounts.*—The accounts of the electricity undertaking to March 31st, 1914, show a net surplus of £1,163, of which £448 has been transferred to relief of rates, £217 has been placed to reserve, and £273 to the meters fund, the remainder being disposed of in other small items. The gross revenue was slightly less than in the previous year, owing to reductions in the price for both traction and lighting.

**Slaford:** *Supply of Arc-Lamp Carbons.*—The Borough Electrical Engineer reports that there is a sufficient stock of carbons to last ten months if the arc lamps are only lighted on Saturday nights. It has been decided to adopt this course.

**Stamford:** *Generating Plant Commandeered.*—According to a local paper the Urban Electric Supply Co., who own the works in Stamford, had a 200-kw. generator ready for delivery at the outbreak of hostilities, but it was commandeered by the War Office. In connection with the scheme of extensions in hand the engine has now been installed and a new dynamo has been ordered.

**Contravention of Factory Act.**—The North Eastern Marine Engineering Co., Ltd., have been fined £50 and costs at Sunderland for a breach of the electrical regulations of the Factory and Workshop Act, 1901. On July 21st a workman received a fatal electric shock whilst turning on a switch which was not protected in accordance with the regulations. It was stated for the defence that the switch was put in ten years ago, and that there had been no previous accident through it. Furthermore, it was alleged that the factory inspector had never pointed out that it was dangerous.

**The Bradford Electrical Exhibition.**—The Sub-Committee of the Corporation, which has the arrangements for the proposed electrical exhibition next month in hand, have passed a resolution recommending that it be postponed for the present, and that the organisation of it be continued at the earliest favourable moment.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 403 [VOL. X., No. 38]  
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THURSDAY, SEPTEMBER 17, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

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United Kingdom. 6s. 6d. per Annum.

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

### SUMMARY

THE latest Government proclamation with regard to trading with the enemy (the more important passages of which we quote this week), gives considerable latitude, of which many people will not desire to avail themselves. (Page 502.)

THE street lighting and railway station lighting of London have been materially reduced as a preliminary step towards rendering difficult the identification of particular points by airships at night. (Page 502.)

A NEW electricity works is being finished at Bolton to supplement the supply from the old works, and one of the two 4,000 kw. turbo-alternators is ready to be put on load. We publish a description of the station with a sectional elevation. (Page 503.)

THE heat treatment of steel for the manufacture of permanent magnets is described in our "Questions and Answers" columns. Readers are asked to suggest the best arrangement of a network of barbed wire, charged at 8,000 volts for the protection of a town against assault. (Page 504.)

THE electricity supply to the Sheffield tramways is to be taken over by the electricity committee instead of being separately managed as heretofore. (Page 504.)

A DESCRIPTION of the manufacture of Mazda half-watt lamps appears on page 505.

AMONGST the Patent specifications issued last week, were two relating to the manufacture of metal filament

lamps.—Application has been made for the suspension of a Patent for a self-cleaning sparking plug, owned by an alien enemy. This is the first electrical patent to be dealt with under the new rules. (Page 506.)

TELEPHONIC communication is available for the first time between South Australia and Victoria. (Page 506.)

MR. SYDNEY BAYNES, of the St. Pancras Electricity works, sends us drawings of arc lamp globes and asks other lighting authorities using similar globes to communicate with him. (Page 507.)

A LETTER from the General Electric Co. explains the circumstances in which a large amount of the share capital of the Osram Lamp Works is held in Germany. We also publish a long letter relating to the capital and management of the British Thomson-Houston Co., and some communications from other firms. (Pages 507 and 508.)

THE Institutions of Electrical, Civil, and Mechanical Engineers have been asked to obtain 500 men for the Divisional Engineer Units and Signal Company of the recently formed Royal Naval Division. (Page 508.)

A BRITISH magneto for motor cars is described in our Trade Section. (Page 509.)

THE Sydney Corporation has placed a contract for a 5,000 kw. turbo-alternator with Willans & Robinson, and has granted exceptionally favourable terms of payment. This replaces a German order given some time ago. (Page 510.)

EXTENSIONS are contemplated as follows:—Ashton-under-Lyne (£42,000); Bristol (£42,000); Cleckheaton (£2,200); Sheffield (£5,080); Bolton (£1,463); Torquay (£16,500).—Extra high-tension switchgear, static transformers, and low-tension switchgear are required at Walsall; electrical fittings at Brighton and Warrington; and electric motors at Whitefield. (Page 510.)

THE report by Sir John Snell on the Southampton electricity undertaking is to be considered at a special meeting of the Council.—The Dover Corporation has definitely refused to consider a bulk supply offer by the South-east Kent Electric Power Co.—Electricity for street lighting is to displace gas at Rochester. (Page 510.)

### NOTICE.

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### TRADING WITH THE ENEMY

**T**HE issue of the Proclamation last week defining what is meant by trading with the enemy, makes it quite clear that much greater latitude is allowed by the Government than was at first thought. The main passages in the Proclamation are as follows:—

The expression "enemy" in this Proclamation means any person or body of persons of whatever nationality resident or carrying on business in the enemy country, but does not include persons of enemy nationality who are neither resident nor carrying on business in the enemy country. In the case of incorporated bodies, enemy character attaches only to those incorporated in an enemy country.

We do hereby accordingly warn all persons resident, carrying on business or being in Our Dominions—

Not to pay any sum of money to or for the benefit of an enemy.

Not directly or indirectly to supply to or for the use or benefit of, or obtain from, an enemy country or an enemy, any goods, wares or merchandise, nor directly or indirectly to supply to or for the use or benefit of, or obtain from any person any goods, wares or merchandise, for or by way of transmission to or from an enemy country or an enemy, nor directly or indirectly to trade in or carry any goods, wares or merchandise destined for or coming from an enemy country or an enemy.

Not to enter into any commercial, financial or other contract or obligation with or for the benefit of an enemy.

Provided always that where an enemy has a branch locally situated in British, allied or neutral territory, not being neutral territory in Europe, transactions by or with such branch shall not be treated as transactions by or with an enemy.

Nothing in this Proclamation shall be deemed to prohibit payments by or on account of enemies to persons resident, carrying on business or being in Our Dominions, if such payments arise out of transactions entered into before the outbreak of war or otherwise permitted.

This, it would appear, actually gives permission to buy from or sell to a German firm established in this country, if its business here is incorporated in the form of an English company, although it is a criminal offence for an employé of the firm to transmit money to Germany or Austria directly or indirectly.

But the things one may do are not necessarily the things one will do. No decently-minded man will now buy German-made goods from the English branch of a German firm instead of buying British-made goods from his fellow-countrymen. The fact that the goods were made and sent to this country before the outbreak of the war does not make any difference.

There is another problem, however, which is perhaps more difficult of solution. Many cases are arising in which the English branch of a German company has had contracts to execute abroad and has been unable to complete delivery of the plant and material owing to the outbreak of the war. The company is endeavouring to buy goods to make up the contract from British firms. Are they to supply them? It is an outlet for new British trade, but it assists the German competitor, who has obtained a foothold here, to retain his position in competition with British firms, and, moreover, the goods with which the German firm has been helped out may even go forward without any indication of the name of the actual maker. In our opinion, the furthest point to which a respectable firm should go in this direction is to accept a transfer of the part of the order in question by the customer himself—if that customer is not an alien enemy in the literal meaning of the term (not in the restricted definition of the Proclamation).

Another class of firm from which Englishmen should not buy are those which have established themselves here with German capital, primarily for the sale of German-made products, but have built a small works here as a "blind." Sometimes these works are very little more than repair shops, sometimes they are hardly better than packing sheds.

We come finally to a third case, to which many columns have been devoted recently in the daily Press. Several electrical firms in this country are working with German capital for the benefit of German shareholders, but have always been manufacturing the greater part

of their products for the British market in their own works in this country. At the present time they are an appreciable factor in keeping our industries at work and our workmen employed. People have been exhorted not to deal with them, and, in fact, it is now an open secret that the council of the British Electrical and Allied Manufacturers' Association are disposed to recommend a boycott of the firms in question, and are taking a referendum of the members of the Association on the matter. We propose to return to this branch of the subject next week.

Messrs. Dorman & Smith, Ltd. (Salford, Manchester) have sent the following letter to the Assistant Secretary of the Board of Trade. They are of opinion that the attitude they have taken up is the correct one, and will be glad to know that they have the support of all their British competitors.

DEAR SIR,—We are in receipt of your communication of the 12th inst., enclosing copy of the King's Proclamation of the 9th September, "Relating to Trading with the Enemy," and we further note that under clause 5 (sub-clause 7) of same, it would be a contravention of the law to supply goods for the use or benefit of an enemy.

We have before us at the moment the status of the A.E.G. Electrical Co., Ltd., and as we are informed that the bulk of the shares of this company are, or were quite recently, held in Germany, we have declined to continue any business relationship with this company, in compliance with the above clause 5 (sub-clause 7). We are, however, threatened with penalties by the A.E.G. Electrical Co., Ltd., for the non-execution of an order for which we had tendered, and we are asking for the support of our competitors in the attitude we have taken up.

Mr. W. Perren Maycock urges us to publish a weekly list of firms mainly or partly "enemy," either as regards management or shareholders. He desires to include as enemies, in this sense, any German or Austrian who has not been naturalised over ten years. We regret that we cannot accede to Mr. Maycock's request. The majority of our readers already know whether the firms with which they deal are German or not, and the general public has been already sufficiently well informed by the daily press.

### THE LIGHTS OF LONDON

**T**HE lights of London have been dim since last Thursday, not because of a shortage of arc-lamp carbons, nor for the purpose of economising fuel, but as a dress rehearsal to ascertain to what extent the identification of particular parts of the metropolis might be rendered more difficult to the enemy's airships if these were to raid the metropolis. In some places the arc lamps were extinguished altogether, in others alternate lamps were lighted, and in other cases the globes of both electric and gas lamps were partially obscured to absorb light rays in an upward direction. The lighting of the various glass-roofed railway stations was also diminished, and dull gas lamps were alight in place of arcs. It would not be to the public interest to give details of the various steps taken, but it is not inconceivable that further diminution in the street lighting would be deemed advisable in the event of a bomb-throwing raid by German Zeppelins being considered imminent.

### THE NEW POWER STATION AT BOLTON

**T**O cope with the continually increasing demand for electricity in the Bolton area, an additional power station is being erected at Back O' Th' Bank, a spot about a mile distant from the old station in Spa Road. Although the erection was only commenced on May 2nd, 1913, the work is now nearly completed, and one of the two 4,000-kw. turbo-alternators is ready to be put on load. The demands made upon the plant at Spa Road have gradually increased until it is working at its utmost capacity, and it is anticipated that the new station, in addition to materially relieving this stress, will enable considerable economies to be effected, owing to the adoption of modern labour-saving appliances and plant.

In choosing the site, care was taken to provide for obtaining adequate supplies of water and coal. The station is situated on the river Tonge, and three reservoirs have been constructed, having a total capacity of 2,000,000 gallons, and the arrangements permit the circulating water for the condensers to be drawn from and discharged into the reservoirs or the river as may

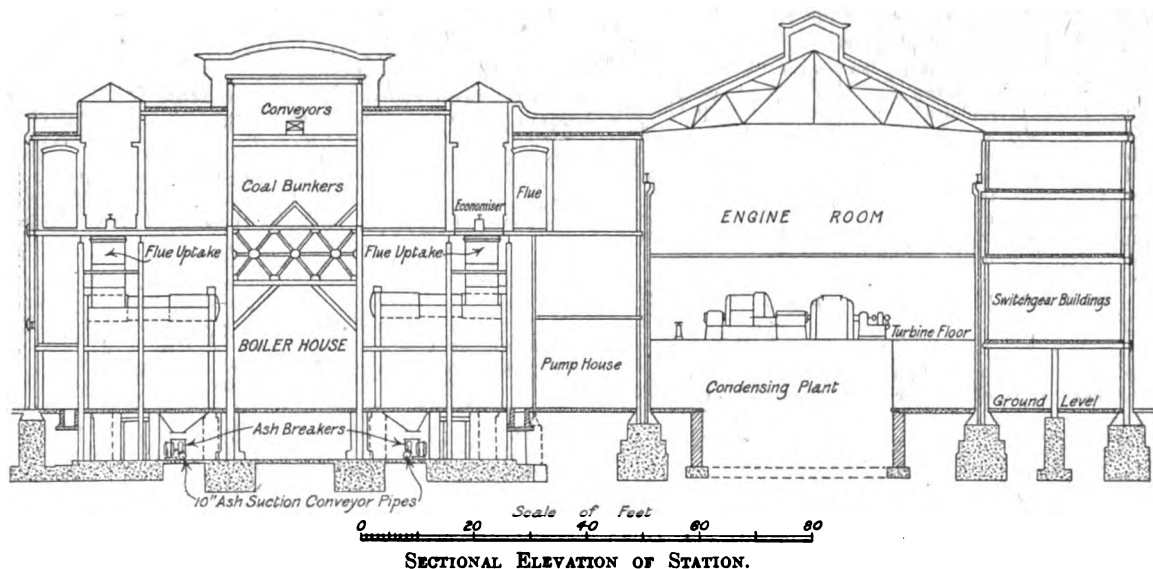
be required. A railway siding runs level with the top of the boiler house, and the coal is passed from the trucks into the main bunker by a rotary tippler, and a conveyor belt transports the coal from the main bunker to the boiler house bunkers which hold 50 tons over each boiler. From here it is led through Avery automatic weighers and into the stoker hoppers.

The boilers are four in number and are of the Babcock & Wilcox water tube type, capable of yielding 34,000 lbs. of steam per hour each, with chain grate stokers and Green's economisers. Natural draught is relied upon and is obtained by two chimneys, each 250 ft. high. The ash and clinker from each boiler are led into crushers from which they pass into a main suction pipe and are drawn into a closed suction chamber which can be emptied at intervals. The turbo-alternators are Musgrave-Dick, Kerr sets and are each rated at 4,000 kw. The supply is 3-phase, 6,500 volts, 50 cycles. The turbines exhaust directly into their own condensers which are each capable of dealing with 56,000 lbs. of steam per hour at 28 in. vacuum with the barometer at 30 in. and a circulating water temperature of 70°Fah. The auxiliary plant for the condensers is electrically driven throughout and, normally, is supplied from the 'bus bars through a

with a special insulating compound, "Floorine," which gives a pleasing finish to the surface, and a spiral staircase of steel provides a means of rapid communication between this floor and the switchgear cubicles in the room below. In passing, it may be of interest to note that all the concrete used for the floors and foundations of the station has been made from the sand and gravel excavated from the site, only a portion of which is occupied by the station as it now stands, as provision has been made for further extensions.

The lighting of the engine room has received careful consideration and it has finally been decided to adopt half-watt lamps, six of which will be required. At present, only two of these are fitted, and even now the illumination is found to be very satisfactory.

It will be remembered that all the coal used is automatically weighed before being burnt in the boiler furnaces. In addition to this, the steam consumption of each turbine is continuously measured and recorded by means of "Precision" water meters, by Alex. Wright & Son, arranged to measure the discharges from the respective air pumps. The cooling air for the alternators is supplied through Balcke dry air filters, and is led from the filters to the air ducts in the founda-



transformer, and in this connection a small substation equipment has been installed. A Brush motor-generator of 200 kw. capacity is used for charging a battery of "Chloride" cells which supply the continuous current necessary for energising the operating solenoids of the main switches which are of the remote control type. For starting the auxiliaries, the battery drives the motor generator, and the supply is taken from the A.C. side of the latter. The capacity of the battery is sufficient to enable it to run the auxiliaries for a considerable period in case of failure of supply. By this arrangement, the inconveniences attending the use of steam-driven auxiliaries are avoided, whilst at the same time the station is entirely independent of outside supply.

The switch gallery, which is adjacent to the engine room, has a remarkably neat appearance. The switches proper are arranged in the room below and, as has been stated above, are of the remote control type. Two sets of switchgear cubicles, of which the feeders are separate from the machines and arranged in groups, are controlled by group switches from the machine cubicles in the gallery above. Ample space has been left to allow for the addition of further sets, which it is anticipated will be needed as the station is extended. The Westinghouse Co. were contractors for the switchgear. The floor of the gallery is of concrete, covered

tions of the alternators in the usual manner. The cables are paper-insulated, lead-covered, and armoured, and are supplied by the British Insulated and Helsby Cables, Ltd.

The power distribution from the new station will be made to fit in, as far as possible, with the existing arrangements. As Bolton is essentially an industrial centre, the supply is mainly for power purposes in mills and factories. All power consumers obtain supply through transformers directly from the H.T. mains, the transformation being from 6,500 volts to 400 volts 3-phase. In addition, feeders are to be taken from the Back O' Th' Bank station to three substations at Duncan Street, Spa Road, and Bradshawgate. Of these, the second is the old power station, and the third has not yet been erected. As the demand upon the new station is likely to be very largely augmented in the future, a light steel temporary end has been used at one end of the building, so that further extensions may be easily carried out when required.

The striking feature of this installation is the attention which has been bestowed upon labour-saving appliances, the ideal which has been kept in mind being, as Mr. W. J. H. Wood, the electrical engineer of Bolton, put it, to run the station with the staff alone. We are indebted to Mr. Wood for allowing us to inspect this interesting and up-to-date station.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,409.

It is desired to erect around a city two miles in diameter a system of barbed wire charged at 3,000 volts as a protection against assault. Two three-phase generators, each capable of supplying 5,000 kw. continuously at this pressure, are available. Suggest the best design for the network, and the method of connection and arrangements of cut-outs, taking all the circumstances into consideration, including the necessity of automatically cutting out a section of the wire temporarily, if earthed, to save burning out the generators, and so cutting off the pressure from the whole network, and, if possible, the automatic replacement of cut wires.

(Replies must be received not later than first post Thursday, October 1st.)

### ANSWERS TO No. 1,407.

What is the best procedure for the hardening, tempering, or other heat treatment of steel for the manufacture of permanent magnets of great constancy for measuring instruments?

The first award (10s.) is given to "M." for the following reply:—

The steel used for making permanent magnets for instruments should be hardened by being heated to a temperature well above the recalcence point of the steel, and then quenched in water. To ensure good results it is essential that the steel should be heated perfectly uniformly, otherwise it will crack when plunged into the water. Also the temperature at which the steel is quenched must be correct for the particular brand of steel used.

In order to fulfil these two conditions it is usual to heat the magnet in a hot bath of lead or other molten material. A material which has come into use of recent years, and which is used by some of the leading instrument-makers, is common salt. The salt is heated in a crucible to a temperature of about 1,200°C., at which temperature the salt is quite liquid. The magnet to be hardened is immersed in the hot-bath for a short period, and, before quenching it, the pole tips are clamped in a gig to prevent it from warping in the cooling process.

The actual temperature of the magnet may be varied by varying the time of immersion in the hot-bath, as it is not necessary to leave it in the bath long enough to attain the maximum temperature. In order to ascertain the best temperature, an experiment should be made with several magnets, which can be hardened after being immersed for different periods. The magnets should then be magnetised under exactly the same conditions; the strongest magnet is picked out, and the remainder can then be treated in exactly the same way as this sample. It is always advisable to test a magnet occasionally, when hardening a batch, to see that they keep up to the standard, as the temperature of the bath may alter, and so necessitate an alteration in the period of immersion.

"AGATE," to whom the second award (5s.) is given, says:—

The forging of the magnet should be carried out at as low a temperature as is convenient, and with as little working as

possible. After forging, the material should be brought to a normal state by heating it to 900°C., cooling it to 750°C., and then, after keeping it at this temperature for a short time, cooling it off to atmospheric temperature. The magnet should then be hardened by raising it to 950°C. for not longer than five minutes, and then lowered to about 700°C., and quenched off at this temperature in brine or oil at a temperature under 20°C.

In the case of instrument magnets, there is not much to be gained by tempering them, but they should be "matured" by boiling or steaming them for ten or twelve hours, or by keeping them at a temperature of about 60°C. for twenty or more hours. The result is improved by letting them cool several times during the process.

For a complete record of technical research on permanent magnets the reader should refer to a lecture on "The Magnetism of Permanent Magnets," by Prof. S. P. Thompson, in the *Journal Inst. E.E.*, Vol. L., p. 80, 1912.

## ELECTRIC SUPPLY DEVELOPMENTS IN SHEFFIELD

### Amalgamation of Tramways and Lighting Departments

**A**N important report dealing with the supply of electrical energy to the tramways has been presented to the Corporation as the result of a conference between the Tramways and Electric Supply Committees.

Hitherto the tramways in Sheffield have been supplied from the Kelham Island power station, and originally the general supply for lighting and power was given from the Commercial Street station. Since then, of course, the Neepsend power house has been constructed and developed for the general supply, whilst certain additions have been made to the Kelham Island power station for tramway purposes. Latterly, however, a certain proportion of tramway energy has been taken from Neepsend, and the committees now recommend that it is not advisable to continue to develop the Kelham Island as a separate and isolated unit, but that power should be taken from Neepsend and dealt with by means of converting plant at Kelham Island, retaining the present generating plant at the latter, so that both power stations will be available. It is suggested that two 1,500 kw. converter sets be put down at Kelham Island as soon as possible, and that all current supplied from Neepsend be charged for at the rate of 0.8d. per unit measured at Kelham Island, on the D.C. side, the price to be subject to revision in three years.

In order to give full effect to this scheme it is further recommended that the capital account of the Kelham Island power station and the electrical equipment up to and including the section pillars be taken over by the electric supply department. This account stands to-day as follows:—Total capital, £318,064; payments to sinking fund, £96,914, leaving an outstanding capital charge of £221,150, plus the cost of the section pillars. Incidentally the benefit of all statutory provisions and powers to borrow money relating to Kelham Island and the electrical equipment up to and including the section pillars, is to be transferred to the electrical supply undertaking. Similarly all stores relating to the tramway power station and distribution system are to be transferred to the electric supply department at cost price or at a price to be agreed upon between the general managers of the respective undertakings, or failing agreement at a price to be fixed by the city treasurer.

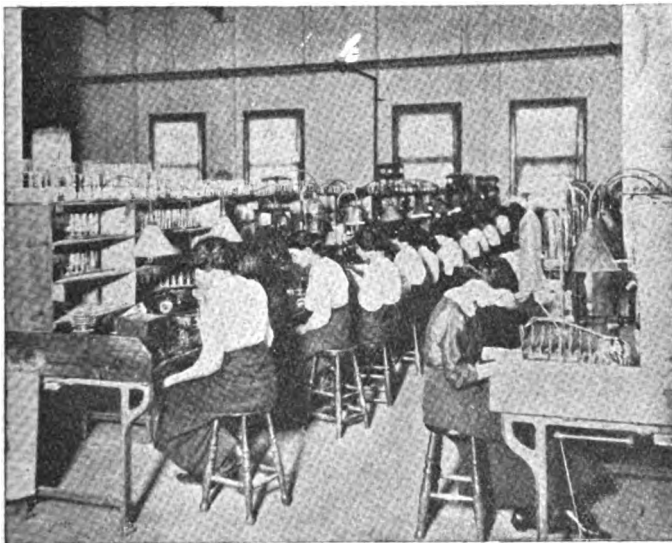
The scheme involves, moreover, the transfer of the whole of the power station employees and also those engaged upon the distribution system to the electric supply department, and as we reported in our last issue, Mr. H. E. Yerbury, the present Electrical Engineer of the Tramways Department, is to be appointed Deputy General Manager and Engineer of the Electric Supply Undertaking, under Mr. S. E. Fedden, the present General Manager. The question of appointing a deputy to Mr. Fedden at a salary rising to £600 per annum, has been under consideration by the electric supply committee, but in view of the recommendation with regard to Mr. Yerbury this will not now be done, and, further, both Mr. Fedden and Mr. Yerbury have offered to accept the additional responsibilities imposed by the proposed transfer and amalgamation without an increase in salary at the present time, having regard to the national crisis. It is understood, however, that at an opportune time the salaries of these two officials should be reconsidered.

The report has been adopted by the City Council, subject to the necessary legal adjustments being made.

**The Association of Mining Electrical Engineers.**—In consequence of the abnormal state of the country, and the possibility of a large number of members being on active service, all arrangements in connection with the South Wales branch have been cancelled, and the visit of the Association to South Wales on October 2nd and 3rd has been postponed; but should circumstances permit, the meeting of the full Association will be held in the district some time next year.

## MANUFACTURE OF THE HALF-WATT LAMP

**L**AST Friday we responded to a pressing invitation to visit the lamp works of the British Thomson Houston Company at Rugby to convince ourselves, not only that half-watt lamps were being manufactured there, but that they were being manufactured on a commercial scale and at a rapid rate. For obvious reasons we are not permitted to describe the methods of manufacture in detail, but we have been allowed to publish a general outline of the methods of manufacture with—needless to say—some of the operations omitted. The several processes are being carried out



FILAMENT SHAPING AND MOUNTING.

simultaneously to prepare the various parts for assembly. First, there is the preparation of the filament until it is ready for mounting, and, secondly, the making of the stems, with their leading-in wires and the supports for the mica baffle plate which is held in the neck of the lamp, and the glass spider with the filament supports and the assembling of these. Then comes the mounting of the filament. Meantime, the glass bulbs are "tubulated," that is to say, pierced and fitted with a glass tube for exhausting. Then follows the sealing-in process, in which the stems with the filaments on them are sealed into the glass bulbs. Finally is the exhausting of the lamps, the filling with gas and sealing the pip.

We will commence with the treatment of the filament after it has been drawn, following the preparation of the metallic tungsten from the tungsten oxide and the subsequent drawing of the wire as carried on in the works. The filament of drawn tungsten wire is wound from bobbins by an extremely ingenious machine into the close helix, which is one of the now well-known characteristics of the half-watt lamp. An examination of one of these lamps shows that the helix is opened out at each of the supporting hooks, and this is done carefully and deliberately by the machine itself, and is not left to the operator who mounts the filaments. The filament is then shaped and made absolutely ready for mounting.

The supporting strip (a flat strip pressed to shape, with a bend to retain the mica baffle plate in the neck of the bulb) is cut out by a small machine worked by hand; the leading-in wire which makes connection with the filament, and the sealing-in wire which passes through the glass, are cut separately, and then joined together, the glass stem is prepared, as well as the spider for the filament supports, and the whole is then fixed together ready for the reception of the filament. The glass spider, which is one of the parts peculiar to the half-watt lamp, and is not employed in the

ordinary lamp, is made of special glass to withstand the great heat near the filament, and the machine for making this, although simple, is most ingenious, leaving very little to the skill of the operator. In fact, the keynote of the whole of the manufacture is that almost every one of the numerous processes has been brought down practically to a purely mechanical and continuous series of operations. The first and last operations are performed by hand, and the machine itself carries out the intermediate ones in the proper sequence with hardly any intervention by the operator in charge of the machine. Each stage in the manufacture of the various parts and in their gradual assembly to form the complete lamp is done by a different set of operators, every one of whom has become deft in the speedy and accurate handling of the machine and the material.

After the filaments have been mounted on the stems, the sealing-in process follows, and then the exhaustion and gas filling, as already mentioned. After this the lamps are tested and packed.

During our visit, while we were examining some of the glass-blowing, the fire bell suddenly sounded. The girls all left their work promptly and filed out of the various exits in a quiet and orderly manner, and the works were emptied in almost a minute. This fire-drill takes place, perhaps, once or twice a week, always at different times and unexpectedly, and there is no doubt that, if an actual fire occurred, the retreat would be as orderly and effective.

We have only mentioned the manufacture of the half-watt lamps during the course of this article, but in passing through the works we noticed some other comparatively new types of lamp in addition to the ordinary patterns which are turned out by the thousands. Automobile and various other types of battery lamps were being made, and it was interesting to see the small bulbs for these being blown in a machine by compressed air, instead of by the mouth. We also



SEALING-IN

noticed the new type of tubular or "Mazdalite" lamp for strip lighting, employing a length of spiralsed filament.

In fact, we passed a most interesting couple of hours at the works, and, as the British Thomson Houston Co. are inviting any of their customers, who are interested, to come down to see the manufacture of half-watt lamps themselves, we strongly advise our readers to take advantage of the offer. They will convince themselves that the British Thomson Houston Co. is in a position to supply the British market with British-made half-watt lamps of unsurpassed quality.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published September 10th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

*Names in italics indicate communicators of inventions from abroad.*

16,208/13. **Controller.** A. MOND. The handle of the controller is moved into any desired position, thus closing the circuit of an electro-magnet which turns the contact cylinder of the controller, through a pawl and ratchet wheel, step by step, until the cylinder is in the position corresponding to that of the controller handle. The circuit of the electro-magnet is then automatically broken. One figure.

18,448/13. **Incandescent Lamps.** B.T.-H. Co. (*G.E. Co., U.S.A.*). To increase the useful life of metallic filament lamps, nitrogen at a pressure of not less than 1/5 mm of mercury, and not more than 50 mm. for each sq. cm. of filament surface, is introduced into the bulb before sealing.

20,122/13. **Manufacture of Tungsten Wire.** C. GLADITZ. A method of tungsten wire of uniform tensile strength. The wire is *cold drawn*, and the cross-section is reduced by approximately 20 per cent. by each drawing operation. When the original cross-section has been reduced by about 50 per cent., the wire is wound on bobbins and is annealed by being passed through a heating chamber in an atmosphere of inert gas, where the temperature is gradually raised to 250°-400° C., and then gradually reduced to its initial value. The bobbins are placed on a conveyor belt which carries them at the required speed from one end of the furnace to the other, thus ensuring uniform treatment. Three figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** AYRTON [Holders for electrodes] 26,367/13; STAVE [Lamp globes] 29,425/13.

**Dynamos, Motors, and Transformers:** STORER [Dynamo-electric machines] 12,641/14.

**Electrometallurgy and Electrochemistry:** TANTON and AYMARD [Electrolytic recovery of metals] 19,669/13; QUENEAU [Furnaces] 10,061/14.

**Heating and Cooking:** PERRY and CREDENDA CONDUITS Co. [Cooking apparatus] 29,070/13; PATE and WOOD [Griller] 2,118/14.

**Incandescent Lamps:** MACKAY [Lamps] 1,252/14.

**Storage Batteries:** SVENSKA AKKUMULATOR AKTIEBOLAGET JUNGNER [Electrodes for alkaline accumulators] 1,062/14.

**Switchgear, Fuses and Fittings:** TUCKER [Switches] 19,388/13.

**Telephony and Telegraphy:** HULL [Party-line systems] 19,249/13; WESTERN ELECTRIC Co. (*Woodward*) [Impulse-producing mechanism] 19,752/13; THOMPSON [Automatic telegraph transmitters] 23,137/13; VAN KESTEREN [Telephone systems using reinforcing repeaters] 29,165/13; GRAHAM and SANFLEBEN [Telephone systems] 767/14; FRATELLI MARZI DI G. B. [Microphones] 2,624/14.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The *Financial News* announces that telephonic communication between South Australia and Victoria is available for the first time. The construction of the line has occupied about eighteen months, the total distance being 480 miles with no intermediate stations.

It is stated that the cutting of the Pacific cable, mentioned in our last issue, was done by a landing party from the German cruiser *Nürnberg*, which approached flying the French flag.—The Tokio-Guam cable failed on the 10th inst., and this is rather suggestive of cable-cutting.—Mr. Hobbouse declared in the House since our last issue that he is unable to permit the use of codes for commercial messages.—Telegrams to poste restante are again accepted for Swiss places since the 15th inst., but will only be delivered to addresses after identification.

Telegraphic communication with the Republic of Colombia is cut off, due, no doubt, to the failure of one of the T pieces from the main Panama-St. Elena cable. Meantime, arrange-

**Traction:** PRENTICE & STARRIE [Signalling systems] 19,019/13, 19,020/13.

**Miscellaneous:** CROSBEE, CROSBEE and ROGERS [Diaphragm horns] 25,795/13; O'KEENAN [Synchronising clocks] 2,924/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Incandescent Lamps:** WOLFRAM LAMPEN AKT.-GES. [Manufacture of ductile alloys with high melting point] 29,980/13; A.E.G. [Lamps] 18,566/14.

**Instruments and Meters:** BESAG [D.C. meters] 17,768/14.

**Telephony and Telegraphy:** SEELAU [Telegraphone] 14,439/14; HEYLAND [High-frequency generators] 17,331/14.

**Miscellaneous:** SIGNAL GES. [Device for use with motors] 10,048/14; VULCAN MASCHINENFABRIK A.G. [Cooling electro-magnetic clutches] 17,455/14.

The following Amended Specification may now be obtained:—  
**Distributing Systems, Cables, Wires, &c.:** W. CROMPTON & Co., LTD. [Regenerative motor control systems] 6,806/13.

### Application for Suspension of Patent

7,617/10. **Sparking Plug.** L. PODSZUS (Berlin). In accordance with the recent Act relating to British Patents owned by alien enemies, application has been made by J. H. Meyer, of London, for the avoidance or suspension of the above Patent. It relates to a self-cleaning plug consisting of a hollow central electrode in conjunction with a cylindrical outer electrode. Air is drawn through the central electrode and is deflected so as to scour the ignition points, thus cooling and cleaning them thoroughly.

### Opposition to Grant of Patents

3,481/14. **Electric Hair Curlers.** M. LUDICKE. The right to the grant of this Patent has been surrendered.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** H. BECK and DEUTSCHE BECK-BOGENLAMPEN GES. [Improved A.C. electromagnet] 12,253/07.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** A.E.G. [Arrangement of winding-motors] 5,250/06; NEW IGNITION SYND., F. J. ROUSE and W. J. L. SANDY [Plug couplings] 11,610/08.

**Dynamos, Motors, and Transformers:** H. A. MAVOR and MAVOR & COULSON [Motors for ship propulsion] 12,072/07.

**Electrometallurgy and Electrochemistry:** M. RUTHENBERG [Arc furnaces] 12,507/09.

**Heating and Cooking:** G. COOPER, F. C. SHARP, and T. A. STEVENS [Immersion heater] 12,562/09.

**Ignition:** W. ROOS [Magnetos] 12,135/07; A. GIORGI [Ignition apparatus for gas burners] 12,470/09.

**Storage Batteries, &c.:** S. BENKÖ [Primary battery electrodes] 12,677/09.

**Switchgear, Fuses and Fittings:** J. DUGDILL [Combined ceiling rose and switch] 11,887/04; H. J. FISHER [Protective devices for electric machinery] 12,452/09.

ments have been made to send messages by wireless.—The deferred and week-end letter service has been suspended to South America until further notice.—The Ceuta-Tangier cable was restored on the 13th inst.

### PATENT LOUD SPEAKING TELEPHONES

COMPLETE INSTALLATIONS FOR

**WARSHIPS, MERCANTILE VESSELS,  
MINES, POWER STATIONS, ETC.**

Adopted by the British Admiralty, Foreign Governments,  
the Leading Shipping Companies, and as used in many  
Electrical Generating Stations.

**ALFRED GRAHAM & CO.,**  
ELECTRICAL ENGINEERS AND CONTRACTORS,  
ST. ANDREW'S WORKS, CROFTON PARK, LONDON.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**SMALL MOTORS.**—The latest catalogue to hand from the British Thomson-Houston Co. (Rugby) is devoted to continuous and alternating current motors of small power. Some interesting illustrations are included, showing the application of the motors to a number of different drives. The power of these motors ranges from  $1/50$  to  $\frac{1}{2}$  h.p., and they are suitable for either 110 or 220 volts. The A.C. motors are designed for a supply frequency of 50 cycles per sec. We understand, however, that the motors can be designed to meet exceptional conditions, providing the quantity required is sufficient to justify departure from the standard.

**INSULATED LAMP HOLDERS.**—Simplex Conduits, Ltd. (Garrison Lane, Birmingham), have issued a list dealing with insulated lamp holders which will take all enamelled iron shades having the standard  $1\frac{1}{2}$  in. opening.

**"ALL-BRITISH LAMPS."**—The Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlessex, and 123 and 125 Queen Victoria Street, E.C.) has issued a bold show card printed in black and red and measuring 32 inches by 20 inches, drawing attention to their "All-British" metal filament lamps.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**ELECTRIC TOOLS.**—A new electric tool catalogue to hand from the Consolidated Pneumatic Tool Co., Ltd. (9 Bridge Street, Westminster, S.W.), deals with "Duntley" drills, grinders, boring machines, hammers, blowers and sand-shakers, couplings for electric cables, &c. The tools are manufactured for both direct and alternating current, and some sizes are wound both for 400 volts to 600 direct and alternating current. In view of the fact that large numbers of electric tools have hitherto come from Germany, the list should prove particularly interesting at the present moment.

**SMALL GENERATING SETS.**—"Panda" electric generating sets are fully described in a pamphlet received from Messrs. Pooley & Austin (25 Victoria Street, S.W.). They have been developed to meet the demand for a dependable and efficient set suitable for yacht, bungalow, and small country house lighting, and they are of British manufacture. The set consists of a Mawdeley dynamo driven by a single-cylinder two-stroke engine running on paraffin or petrol.

**N.P. PUMP RINGS.**—A leaflet just to hand describes the one-ring design of the "N.P." Patent Pump Bucket, a large number of which are now being used successfully in the boiler feed pumps of the North Staffordshire Railway locomotives. The packing ring is of special composition, which is unaffected by any boiler feed temperatures, and which, owing to its adaptability, can be used in a worn liner where an ordinary cup ring packing would be unsatisfactory. Owing to the construction of the bucket, the pressure of the ring against the inside of the liner is automatically adjusted to suit the head against which the pump is working. The makers are the N.P. Pump Bucket Co. (11 Queen Victoria Street, E.C.), and mention may be made of the fact that these pump buckets are, and have always been, British made.

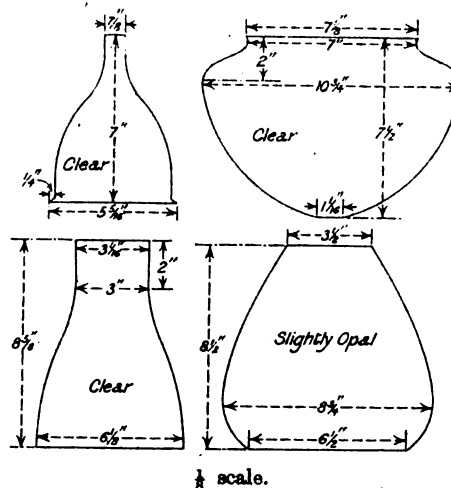
**Australian Import Trade in 1913.**—From a return made by H.M. Trade Commissioner in Australia, it appears that the total imports of "competitive merchandise" from the United Kingdom in 1913 amounted to £38,265,340, as against £6,886,441 from Germany. The proportion of British goods was slightly higher than in 1912. The increased proportion of British imports of machinery, metals, and metal manufactures is particularly high. Details as to the imports of the various classes of goods into the several States of the Commonwealth, showing the shares taken by the United Kingdom, Germany, and the United States, have been specially compiled by the courtesy of the Commonwealth Statistician's Department at the request of H.M. Trade Commissioner, and upon application from British firms H.M. Trade Commissioner, whose address is Commerce House, Flinders Street, Melbourne, will be glad to furnish detailed figures regarding any particular class of goods. Meanwhile a statement showing the imports into the Commonwealth under main headings, as well as the imports from the United Kingdom, Germany, and the United States, also the United Kingdom's share of the imports under these headings into the several States, may be seen on application to the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, E.C.

### CORRESPONDENCE

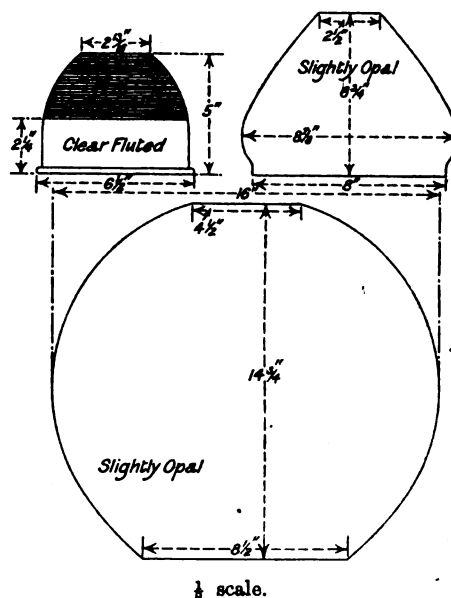
#### ARC LAMP GLOBES.

To the Editor of "ELECTRICAL ENGINEERING."

SIR,—I enclose you drawings of the different arc-lamp globes used in this borough, and I shall esteem it a favour



if you will insert same in your paper, so that other corporations and municipalities of the British Isles who use similar globes can get into communication with myself with a view to arriving at the approximate quantity used per annum. This information would greatly assist British firms in a position



to manufacture, who will no doubt get into touch with us on seeing this article.—Yours faithfully,

57 Pratt Street, Camden Town, SYDNEY W. BAYNES,  
London, N.W. Chief Electrical Engineer,  
September 11th, 1914. St. Pancras Borough Council.

### THE OSRAM LAMP WORKS.

To the Editor of "ELECTRICAL ENGINEERING."

SIR,—In view of the statements that have been made in the papers and elsewhere as to the presence of German capital in the Osram Lamp Works, Ltd., which, appearing by themselves, give a totally erroneous view of the real position of affairs, we beg to state the following:—

The Osram Lamp Works, Ltd., situated at Hammersmith, were formed as an adjunct of the General Electric Company, Ltd., a concern which, with its subsidiary undertakings, possesses nearly £2,000,000 capital, subscribed by 5,000 British



shareholders. The factories of the General Electric Company, Ltd., are in this country exclusively, and employ some 10,000 British workpeople. The Osram Lamp Works, Ltd., do not trade, but manufacture lamps exclusively for the General Electric Company, Ltd.

We desire to explain how this industry was established in England. The metal filament lamp is essentially an Austro-German invention, and when the General Electric Company, Ltd., first realised its importance they immediately endeavoured to promote the manufacture in this country. The difficulty was, however, that the Continental patentees contemplated supplying the English market from Continental works. The General Electric Company, Ltd., offered to find the money for a manufacturing Company through the Robertson Lamp Company, Ltd. (one of its subsidiary Companies), but owing to the differences of opinion that then existed as to the merits of metal filament lamps, a fixed price for the purchase of the patents could not be agreed upon, and the patent owners not unreasonably demanded, and were granted, shares in the factory as payment for their patents and experience.

The passing of Mr. Lloyd George's Patent Act, with its avowed object of introducing industries to this country, materially assisted in the concluding of these negotiations.

If this policy had not been adopted by the General Electric Company, Ltd., there would have been no Osram Lamp Works in England to-day. Thus the General Electric Company, Ltd., forced the establishment of the Hammersmith factory, which eventually involved an outlay in buildings and equipment (in which British workpeople benefited) of over £100,000, and which provides constant employment for approximately 1,500 British workpeople in addition to the very large staff employed by the General Electric Company, Ltd., in the sale and distribution of Osram Lamps.

Yours faithfully, for and on behalf of

The General Electric Company, Ltd.,

67 Queen Victoria Street, E.C. JAMES Y. FLETCHER,  
Sept. 27th, 1914. Manager, Osram Lamp Department.

## THE BRITISH THOMSON-HOUSTON CO.

To the Editor of "ELECTRICAL ENGINEERING."

SIR,—I notice in some of the electrical papers various letters which inquire into the composition of the British Thomson-Houston Co., Ltd.

Although the files at Somerset House tell the whole story, few take the trouble to make an examination, and therefore the following may be of interest, and I would appreciate it if you will publish the information in full.

Our capital consists of 80,000 shares of the par value of £10 each and £186,215 of debentures

Our shares are held as follows:—

44 English shareholders holding	10,458	shares
11 French " "	3,109	"
1 Belgian " "	83	"
9 American " "	64,876	"
1 German shareholder resident in Cologne	333	"
1 German shareholder resident in England	1,141	"
Total	80,000	"

Neither of these last two shareholders, so far as we know, are in any way connected with electrical manufacturing companies either here or in Germany.

We have 106 debenture holders, all of them resident in England, and all English, with the exception of one French lady, who holds £2,000 par value, and she resides in Folkestone.

We have not a single German in our employ, or in any way connected with the Company.

Our active Board consists of the following:—J. F. NAUHEIM, who represents the shares held by Lord Rothschild in our Company. He has resided here most of his life, and has been naturalised between thirty and forty years; GEORGE FRANKLIN, of Sheffield and London, who was at one time Lord Mayor of Sheffield, and who was chairman of the National Telephone Co.; OWEN H. SMITH, who came on originally to represent our debenture holders. He is one of the partners of "The Proprietors of Hay's Wharf, Ltd.," F. FRASER, a Scotsman, who is also our Secretary; W. C. LUSK, Manager of our Commercial Departments; H. N. SPORBORG, our Chief Engineer; and myself, the Managing Director. We (the latter three) are American born, and have been here from ten to twelve years.

The other members of our Board are three Americans residing in New York, who represent large shareholders, and one of them for many years resided in London, namely:—C. A. COFFIN, E. W. RICE, JUN., E. A. CAROLAN. The two former are Chairman and President respectively of the General Electric Company of New York, the parents of this Company and its predecessor, the Thomson-Houston Co., forming the original basis of our Company. C. BURRELL, an Englishman, who has spent most of his life in France, now living in Paris; E. THURNATER, who is

an American citizen, also living in France. These two are Managers of the Compagnie Française pour l'Exploitation des Procédés Thomson-Houston, and represent on our Board the French shareholders.

The total number of our employees is about 5,600, a large number of whom are, of course, young women in the lamp factory.

Our factories are at Rugby, Coventry, and Willesden.

So far about 900 of our employees have joined the colours, which is over 50 per cent. of those who are eligible, and all who have joined, both married and single, receive half wages or salaries while they are away, and their places will be kept open for them until their return to the fullest possible extent. I might also add that no changes have been made in the salaries of those who remain in the Company's employ.

Faithfully yours,

H. C. LEVIS,

Managing Director.

London, Sept. 14th, 1914.

**Record Electrical Co.**—The Record Electrical Co., Ltd., write us as follows:—"We have been informed that a statement has been circulated to the effect that the Record Electrical Co., Ltd., is financed by capital of an alien enemy. The directors wish to give notice that, as this statement is entirely false, they will take immediate action in the courts against any person who, to their knowledge, is party to the circulation of such libellous report."

**Wm. Geipel & Co.**—We have received a letter from this firm to contradict certain rumours which have been circulated to the effect that the firm is alien. Mr. Geipel himself and his entire staff are English born and bred. The firm's manufacturing department, we are informed, has recently extended its London works, which is now equipped for employment of 200 hands.

**Siemens Bros. Dynamo Works and the War.**—Up to last week 400 men had left Siemens Bros. Dynamo Works at Stafford as Reservists or as members of the Territorials or the new army, and a further 120 men have joined from the company's various branches. Ample provision is being made for dependents according to the particular circumstances of each case, and all men will be re-engaged in the same positions at the close of the war.

**The Hart Accumulator Co. and the War.**—Some 40 employees of the Hart Accumulator Co. have joined the forces, and in order to relieve any distress in the families of these men, the whole of the company's employees are contributors two hours' pay each week. In this way, grants to each family, ranging from 15s. per week downwards, will be made, depending on the circumstances. These subscriptions are entirely voluntary, and are being augmented by personal weekly contributions from the directors, and by a weekly grant from the company. The company undertakes to provide the men with their old employment on their return home.

**Dispute as to Ownership of Carbons.**—With reference to the note on p. 489 of our issue for September 3rd, no evidence was offered when the three men concerned appeared at the Central Criminal Court on Friday on the charge of breaking into the Foster Engineering Co.'s works. The civil action will proceed, but the Common Serjeant said it was not a matter for the Criminal Court.

**Damaging Signals on L.B. & S.C. Railway.**—A foreman in the employ of the London Brighton & South Coast Railway Co. has been sentenced to twelve months' hard labour for damaging electric signal wires on the line at Battersea. It was stated that the offence was committed while soldiers were being conveyed south, and it seems to have been done because the offender was not allowed to work overtime.

**The Institution of Electrical Engineers and the War.**—Mr. W. Duddell, President of the Institution of Electrical Engineers, has addressed a letter to members pointing out that the Institutions of Civil, Electrical, and Mechanical Engineers have been invited by the Lords Commissioners of the Admiralty to assist in obtaining picked men for the Divisional Engineer Units and Signal Company of the recently formed Royal Naval Division. The units to be raised are one Divisional Headquarters R.E., two Field Companies R.E., and one Signal Company. A camp is under preparation near Martin Mill Station, Kent, and the total authorised strength is 500, with eighteen officers, in addition to the Commanding Royal Engineer and a medical officer. The terms of enlistment will be for the war, but not in any case exceeding three years. A special recruiting office has been opened at 2 Savoy Hill, Victoria Embankment, London. Many members of the three Institutions having previously expressed a desire to serve in the Army, the formation of an Engineering Societies' Battalion had been contemplated.

### A B.T.-H. MOTOR CAR MAGNETO

IN our issue of August 20th, p. 462, we referred to an important meeting of British motor-car manufacturers for the purpose of making arrangements for the supply of magnetos for motor-cars and motor-cycles. The greatest development in the motor-car industry is to be traced to the substitution of the magneto for the accumulator for firing the charge in the cylinders. For some unexplained reason, the manufacture of this essential piece of apparatus has been left mainly in the hands of German firms, and it has often been a subject of comment that the large British electrical manufacturers have not taken the matter up. The British Thomson-Houston Co., of Rugby, however, has been experimenting with such a magneto for the past twelve months, and the present moment, therefore, is particularly opportune for placing it upon the

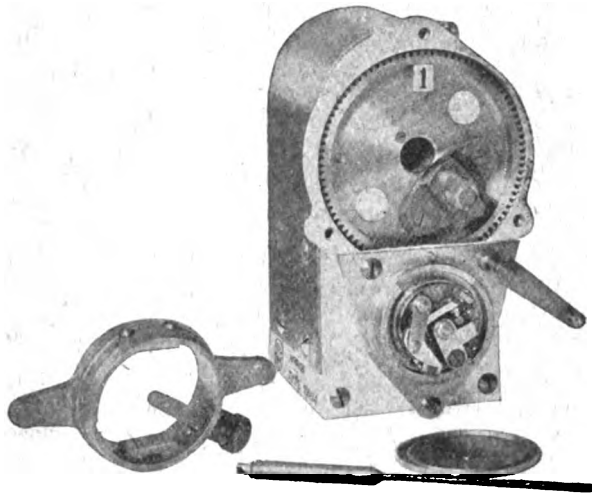


FIG. 1.

market. This magneto, which is manufactured at the Company's Coventry works (a description of which appeared in *ELECTRICAL ENGINEERING* of June 25th, p. 361) has demonstrated its ability to stand up triumphantly under the severest service conditions. In designing and building it, the Company has brought its vast electrical experience to bear upon the subject, and has followed, with the greatest care, the accepted line of magneto manufacture and practice, so that the B.T.-H. magneto is interchangeable with the standard make of magneto, and will give equally satisfactory, if not superior, results.

Like most modern magnetos, it has a base and end plates of aluminium, and is totally enclosed and weatherproof. There is a fine gauze protection cover over a small opening in the top, which enables air to reach the armature so as to dissipate any vapours which may be formed. The magnets, which are made of a special grade of tungsten steel possessing great retentivity, are longer than is usually the case, this resulting in a

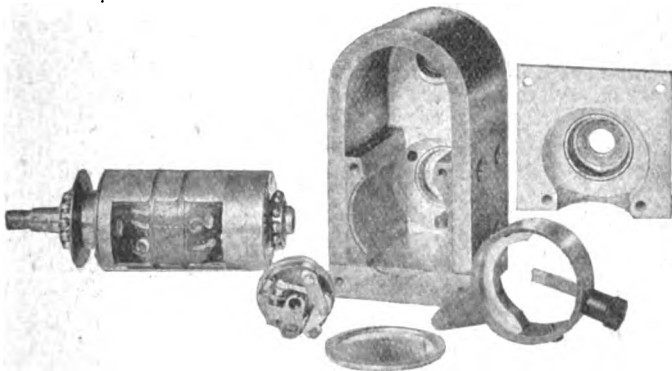


FIG. 2.

more permanent magnet, and a hotter spark at low speeds. The armature is neat and compact; the condenser is contained in a brass cap at one end of the core, and its dielectric consists solely of pure mica sheets. Here, as in many other directions, in the manufacture of this apparatus the electrical experience of the B.T.-H. Company has been of valuable assistance. The high voltage winding is covered with a heavy jacket of suitable insulating material, which by subsequent treatment is converted into a homogeneous waterproof unit. As an additional safeguard for the armature insulation a safety spark-gap is provided, which, in the event of the voltage rising to an abnormal value, acts as a safety valve to prevent breakdown of the insulation. The contact-breaker is seen in Fig. 1,

and, of course, is easily accessible and detachable. The contact points have been given special attention, and they will be found very substantial and ensuring long life. Fig. 2 gives a good view of the rotating and stationary portions of the distributor. The whole is made absolutely waterproof.

These magnetos are at present available in three sizes, a small size suitable for single cylinder motor cycles, and two larger sizes intended for use on four-cylinder cars; other sizes are in course of development.

### A MAZDA SHOWCARD

OUR black-and-white reproduction of the new Mazda showcard being issued by the British Thomson-Houston Co.,



Ltd. (London and Rugby), conveys but a poor impression of the rich colouring and general effect of the original. Dealers should find it effective in stimulating sales.

### "SIMPLEX" HAND LAMPS

TWO electric hand-lamps designed to comply with Home Office Regulation 13 have been produced by Simplex Conduits, Ltd. (Garrison Lane, Birmingham). Both lamps are built on similar lines, but in the case of Fig. 2 a more substantial enamelled iron guard is fitted. The general



FIG. 1.



FIG. 2.

construction of the lamps is that neither the iron guard nor the brass clamping ring can become charged, and as both the lamp-holder and lamp-cap are surrounded by a protecting sheath of insulating material there is no necessity for earthing. A leather loop is attached to the handle.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Ashton-under-Lyne.**—Sanction has been given to the borrowing of £42,015.

**Bolton.**—The Local Government Board has sanctioned the borrowing of £1,463 for the electricity undertaking.

**Bristol.**—A loan of £42,000 is to be taken up for mains, sub-stations, and services.

**Cleckheaton.**—A Local Government Board inquiry was held last week concerning a loan of £2,200 for electrical extensions.

**Heywood.**—The Electrical Engineer has prepared plans and estimates for the proposed bulk supply from Bury.

**Sheffield.**—Mains are to be carried to the Lodge Moor Hospital at an estimated cost of £5,080. Several other mains extensions are to be carried out.

**Torquay.**—A Local Government Board inquiry was held last week concerning a loan of £16,000 for the general purposes of the electricity undertaking, and £500 for the electric lighting of Princess Gardens. Mr. C. W. Salt, the Borough Electrical Engineer, told the inspector that new plant is required immediately.

**Walsall.**—Extra high-tension switchgear; static transformers; low-tension switchgear. Consulting Engineer, E. M. Lacey, 12 Victoria Street, London, S.W. Tenders to Town Clerk by September 29th.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Chelmsford.**—Additions to hospital.

**Colchester.**—Extensions at Infectious Diseases Hospital.

**Eccles.**—School, Anson Street. Architect, J. Knight, 5 Cross Street, Manchester.

**London.**—New wing and alterations to London Institution, Finsbury Circus. Architect, Professor F. M. Simpson, 88 Gower Street, W.C.

**Middlesbrough.**—School at Grove Hill.

**Scarborough.**—Electric lighting of the workhouse (£5,950).

**Stoke-on-Trent.**—School. Director of Education, Town Hall, Hanley.

**Tyldesley.**—New town hall.

**Warrington.**—School, Parr Street.

### Miscellaneous

**Brighton.**—A supply of electrical fittings is required by the Brighton Guardians. Clerk. September 22nd.

**India.**—The Great Indian Peninsula Railway Co. requires supplies of lamps and fittings. Secretary, 48 Copthall Avenue, E.C.

**Warrington.**—The Guardians require a six months' supply of electrical goods. (German and Austrian goods barred.)

**Whitefield.**—Electric motors are required for the sewage disposal works. Borough Engineer.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Manchester.**—A contract for a two years' supply of C.C. and A.C. meters has been placed with Ferranti, Ltd.

**Sunderland.**—The following firms quoted for the two 1,500-kw. A.C.-D.C. converters, for which tenders were recently asked:—General Electric Co. (accepted); British Westinghouse Co.; British Thomson-Houston Co.; Bruce, Peebles & Co.; Dick, Kerr & Co.; Electric Construction Co.; Mather & Platt; Siemens Bros. Dynamo Works; Vickers, Ltd.

**Sydney.**—A contract has been placed with Willans & Robinson for a 5,000-kw. turbo-alternator with condensing plant. The plant consists of a standard Willans disc and drum turbine, to be coupled to a Dick, Kerr alternator, the turbine exhausting into a Willans surface-condensing plant with rotary air pumps. This plant is to take the place of a

German plant ordered some time ago. The municipality has also given the contractors exceptionally favourable terms of payment, which embody monthly instalments as the work proceeds, up to a total of 80 per cent. of the value of the contract on shipment. It speaks well for the reputation of the firm that these terms have been granted, and great credit is due to the Corporation for encouraging a home firm in this way. Messrs. Preece, Cardew & Snell have acted in this country for the Corporation, and it is probable that they have played a not inconsiderable part in the settlement of the terms of payment.

**York.**—The tender of the British Westinghouse Co. has been accepted at £542 10s. for transformers.

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, the following may be taken as the official quotation for electrolytic copper bars, viz., £55 10s. to £56. (Last week, £59 to £60.)

## APPOINTMENTS AND PERSONAL NOTES

Mr. P. A. Lange, Managing Director of the British Westinghouse Co., has adopted the name of Lang. Mr. Lang is a naturalised British subject, and was formerly an American citizen.

The following vacancies have occurred in the Newport (Mon.) Electricity and Tramways Department:—Senior Engineer-in-Charge, £104 per annum; Junior Engineer-in-Charge, 30s. per week; Switchboard Attendant, 25s. per week; Mains Foreman, £2 10s. per week. Applications to Borough Electrical Engineer. (See advertisement on another page.)

A teacher of engineering subjects is required by the Kent Education Committee for the Dartford Technical Institute. (See an advertisement on another page.)

A shift engineer is required temporarily at Tunbridge Wells to fill a war vacancy. Borough Electrical Engineer.

## LOCAL NOTES

**Dover: Bulk Supply.**—The offer of the South-East Kent Electric Power Co. to give the Corporation a supply in bulk came up again at the last meeting of the Council. It was decided, however, to reply that it is not deemed advisable to incur the necessary capital expenditure, having regard to the fact that the price quoted of 3d. per unit for one million units, with a reduction according to the quantity down to 0.72d. per unit, would not involve much economy in consequence of capital charges.

**Hamilton: Valuation of Electricity Works.**—The valuation of £1,288 placed upon the electricity works of Edmundson's Electricity Corporation was appealed against last week, and a reduction claimed to £1,110. The question in dispute was whether superheaters and chain-grate stokers were to be regarded as tenant's or landlord's improvements. The assessor looked upon them as landlord's improvements, adding to the value of the works and profit-making capacity. The Works Manager, however, took a contrary view, and the Court by a majority agreed to reduce the valuation to the figure asked for.

**Rochester: Street Lighting.**—The contract with the Rochester Gas Co. for street lighting has been terminated, and an agreement entered into with the Kent Electric Power Co. for the electric lighting of the High Street and North Street.

**Southampton: The Report on the Electricity Undertaking.**—The joint report by Sir John Snell and Mr. Ernest Edmonds, dealing with the general position of the electricity undertaking and the policy hitherto pursued in connection with it (ELECTRICAL ENGINEERING, August 6th, p. 452) is to be brought before a special meeting of the Council. This decision is the result of an amendment to the original proposal that the report should be referred to the Parliamentary Committee, who should in turn report to the Council.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 404 [VOL. X., No. 39]

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THURSDAY, SEPTEMBER 24, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

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*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for insertion, *Tuesday first post.*  
Small Advertisements and Official Announcements, *Wednesday first post.*  
Displayed Advertisements, *Tuesday first post.*  
Corrections in Standing Advertisements, *Monday first post.*  
All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

### SUMMARY

A DETAILED description of the manufacture of Osram lamps, as at present carried out at Hammersmith, appears on pages 512 and 513.

THE B.E.A.M.A. have removed their ban on firms in which the controlling interest is held in Germany and Austria if these firms manufacture largely in this country.—A letter from representative Siemens workmen protests against "malicious attacks" on the firm from various sources. (Page 514.)

WE describe the Ediswan works, and publish some interesting illustrations taken in the works. (Page 515.)

THE Electrical Vehicle Committee have sent us details of the charging plug they have standardised, and we give full particulars of this, together with drawings and dimensions, and a photograph of a plug actually made already by one manufacturer to this standard. (Page 516.)

THE Board of Trade Report upon accidents on railways in the United Kingdom during 1913, recommends a more extensive use of electric track signalling and also the adoption of some form of cab signalling or wireless control to avoid mistakes by drivers. The electric lighting of railway carriages is also referred to. (Page 517.)

THE Board of Trade Intelligence Department has received many applications from persons abroad desiring to purchase British electrical goods now that German exports have ceased. (Page 517.)

THE running of rotary converters in parallel is discussed in our Questions and Answers columns. (Page 518.)

AMONG specifications published last week at the Patent Office is one relating to the use of phosphorus pentoxide for preventing lamp bulbs blackening, and one for a double armature traction motor. Other subjects include arc lamp carbon holders to economise carbon ends, cooking apparatus, and telephony. An important patent relating to the Wright electrolytic meter expires this week. (Page 519.)

INFORMATION just come to hand, *via* Switzerland, states that already at the end of last month, the Allgemeine Elektrizitäts Gesellschaft found it practically impossible to make any deliveries, export was quite interrupted, and the electrical department was working on very short time. Existing prices were withdrawn, and in many cases were increased by 10 and 20 per cent. Other German firms have been similarly affected. (Page 519.)

THE Edinburgh Corporation proposes, contrary to its usual practice, to contribute a large sum to relief of rates.—A proposed loan of £23,000 at Walsall is to be postponed in the hope that the money will be raised cheaper later on.—Some comments upon purchasing arc lamp carbons abroad were made at a recent meeting of the Bristol Corporation.—A new power station is recommended at Belfast. (Page 520.)

SHORT articles on some electric light fittings, a new winch and electric heaters, a photograph taken at the opening of the Ediswan rifle range, and a letter criticising a circular issued with regard to electric lamps, appear on p. 521.

A 3,000-kw. turbo-alternator is to be purchased at Woolwich; sub-station equipment is required at Littleborough; a water-tube boiler at Lowestoft, and rotary converters at Hornsey.—A loan of £8,000 is to be taken up at Bispham, and electric lighting schemes are under consideration at Troon and Kelso.—Electrical fittings are required at West Ham, and tramway extensions are contemplated at Leicester and York. (Page 522.)

**Engineer Units, Royal Naval Division.**—A Joint Committee of the Institutions of Civil, Electrical, and Mechanical Engineers is engaged in the selection of men for the Engineer Units of the Royal Naval Division. There are still some vacancies to be filled, and applications are invited from engineers and architects who are members of professional societies. Application to be made in person at the Special Recruiting Office, at No. 2 Savoy Hill, W.C., between 10 a.m. and 1 p.m., or between 2 p.m. and 4 p.m.

**The London Electric Supply Scheme.**—The London County Council is proposing to hold a conference on October 2nd with the Borough Councils, who are authorised distributors of electricity, in order to ascertain their views before submitting definite and detailed proposals with regard to the future of the supply of electricity in London.



### THE OSRAM LAMP WORKS

THE Osram lamp works have been thrown open to the public. Large advertisements have appeared in the daily papers inviting all who might care to do so (with the exception of competitors) to apply for an invitation to inspect the factory, and to convince themselves that Osram lamps are made there in enormous quantities. Although we did not need convincing on this point, we gladly accepted a special invitation extended to us by Mr. C. Wilson, the General Manager, and spent an interesting two hours at the works. Mr. F. P. Driver, the Works Manager, who took our representative round, showed him every detail of manufacture with the utmost frankness, in-

The first process is the reduction of the tungsten from the ore, which is now being carried out at the lamp works. It results in a supply of tungsten in a finely-powdered state, and we saw the powder worked up into a form sufficiently tough and ductile to be drawn into a fine wire. It is first compressed under great hydraulic pressure into the shape of a thin, rectangular bar, which is maintained at a high temperature in a hydrogen flame in order to remove all impurities. A current of electricity is then passed through it, bringing it into a more solid state, and preparing it for the process of "swaging," that is to say, a process of hammering under heat, which alters the shape of the ingot to a long, thin rod of ductile tungsten. This rod is then

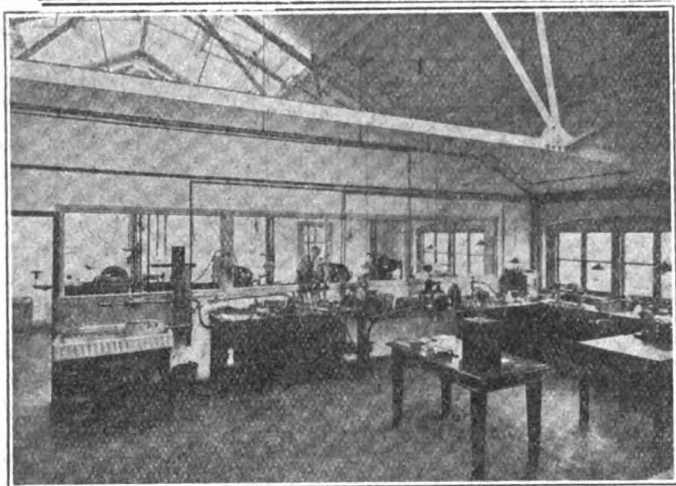


FIG. 1.—PART OF THE WIRE-DRAWING SHOP.

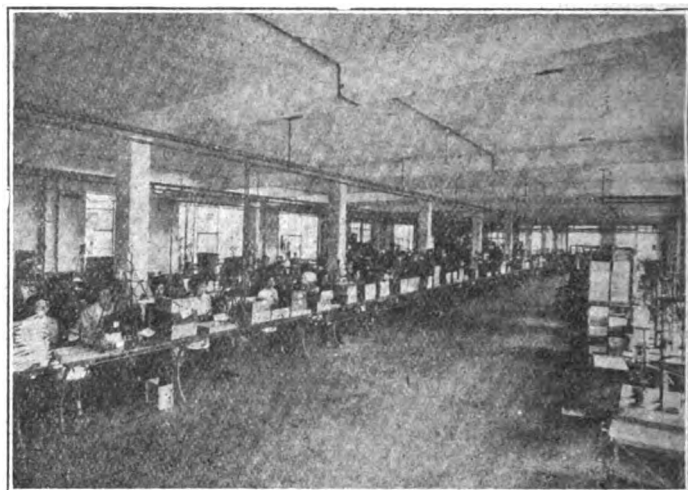


FIG. 3.—FILAMENT MOUNTING.

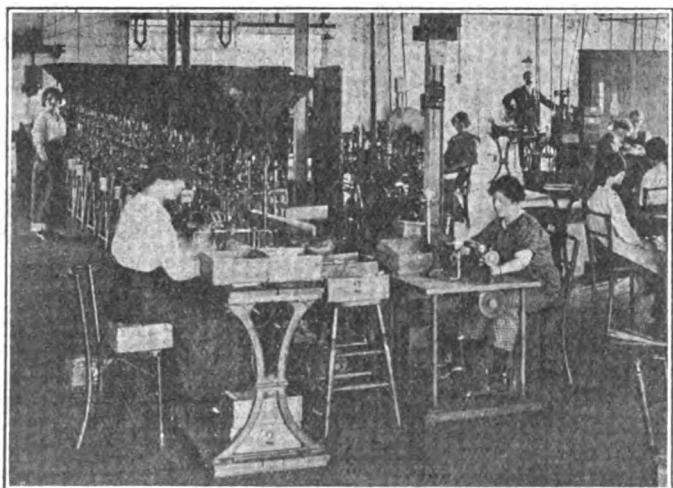


FIG. 2.—MAKING THE GLASS STEMS AND FEET.

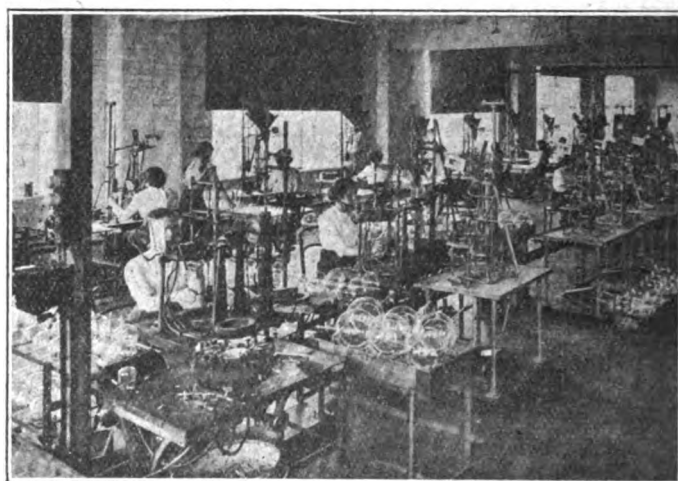


FIG. 4.—TUBULATING.

cluding even the manufacture and drawing of the tungsten and some new automatic machines, which have recently been introduced, for making and assembling the parts of the lamps. Some of the latter are fully automatic; if the blowpipes for heating the glass were not visible one might have thought that brass or iron was being worked, for in some of the machines there is marked resemblance to the complex and accurate actions of the familiar automatic machines used in the lighter engineering works.

The works are at Brook Green, Hammersmith, and occupy a large six-storey building. Every part of the lamp is made at the works, with the exception of the bulbs, which are made at an affiliated works at Lemington-on-Tyne (described in our issue of September 10th), and the lamp caps, some of which are already being supplied from the General Electric Co.'s Birmingham works.

drawn down to the required fineness, step by step, more or less in the usual way. The tungsten wire is wound upon bobbins, and stored for use in the factory as required.

The glass and metal support for the filament is made up of the glass foot (through which the leading-in wires pass) welded to the glass rod or stem, which has a spider of metal wires at each end. The foot, a short glass tube with a funnel-shaped end, is made by full-automatic machines. The tubes are cut into the lengths required for the foot by a machine which combines a blow-pipe and automatic glass cutting action. The short lengths of tube are then placed into hoppers, and fed into an automatic machine, which puts a flange on one end of each tube; a blow-pipe softens the end of the tube, which is then automatically flared out into a funnel-shaped flange by a special tool. One girl tends 26 of these machines. The stems are cut

and shaped in another machine. A long length of glass rod is fed into this machine, the two studs for carrying the supports of the filaments are formed by heating the two points by a blow-pipe flame, and exerting pressure on the rod, and the stem is then cut off with these two studs at the ends. The next step is the bringing



FIG. 5.—EXHAUSTING.

together of the foot, the stem, and the leading-in wires. These are placed together, the unflanged end of the tube is brought under a blow-pipe, and at the right moment clamped flat over the leading-in wires. The leading-in wires are made up of a length of copper wire to connect in the lamp cap, a very short length of platinum to pass through the glass, and a piece of nickel wire for the part within the bulb to make contact with the filament.

The spider of wires which support the filament at the upper or cap end of the lamp are of nickel, and are out and formed with the necessary loop by an automatic machine, and they are heated and inserted into the upper stud of the stem by hand. It is wonderful to see how accurately these are inserted at even distances apart by the work-girls. To some extent, also, the finer wires for the supports at the lower end of the stem, which are of fine flexible molybdenum wire, are also inserted by hand, but an ingenious machine recently introduced has been devised which cuts and inserts a set of these spring supports at one operation.

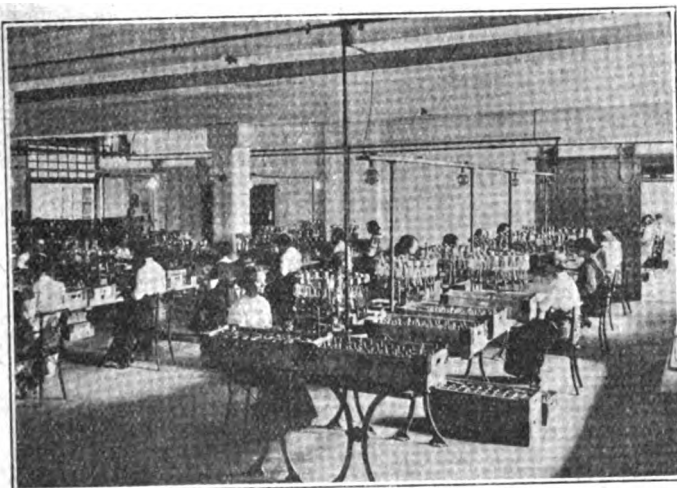


FIG. 6.—CAPPING.

The spring supports are inserted without any loops, and these are made at the next step in the process, when the angles of the spider are also automatically adjusted.

The spider is then ready for the winding on of the

filament, which is done by hand on a special machine and with an ingenious winding pliers. The bobbin of tungsten wire is fixed on to this light hand-tool, and the wire wound up and down over the supports rapidly and neatly. The end of the wire is first clamped on to the end of the leading-in wire, and is then wound over independent supports, clamped to the other leading-in wire, and cut off. The spring supports themselves are not strong enough to stand the operation of winding. A bell-glass is then dropped over the filament, and current is passed through the wire in an atmosphere of hydrogen; the artificial supports are then withdrawn, and the spring supports hold the filament at the requisite tension. A row of operators at this work is seen in Fig. 3.

The "cage," i.e., the completed foot, stem, and filament, is then ready to be fixed into the lamp bulb. The bulb is first pierced by a blow-pipe flame, and the exhausting tube is welded on to it. The rough flange at the other end of the tubulated bulb is then neatly cut away by a rotary blow-pipe action. The cage is inserted upwards into the bulb, which rests in the machine with the exhausting stem upwards. The lower part of the bulb is then held in the blow-pipe and welded to the flange of the glass foot. This "sealing in" and the next operation of exhausting is allotted to the most skilful of the workers.

The exhausting affords a very good example of the ingenious combination of machinery and hand-labour. The bulbs are exhausted, six or eight at a time, and the operators, who sit on trolleys running on the rails of a small tramway, are enabled to pass rapidly up and down and supervise several sets of lamps simultaneously. After exhaustion the bulbs are sealed off, and pass into the testing department.

The final process is the placing on of the cap and the soldering of the leading-in wires. The General Electric Company, as has been mentioned, is now starting to make its own caps, and it has for some time made the cement by which the cap is fixed to the lamp. The machine which places the requisite amount of cement inside the ring of the cap was specially designed in the Osram works, and represents a very ingenious solution of a problem which is superficially easy, but, as a matter of fact, is very difficult. The caps are fixed on the lamps under heat, which is supplied by an electric heater fitting round the cap. The leading-in wires are then cut off and soldered, thus completing the lamp. A short final test is made of the lamp, which is branded and cleaned before being packed. It should be mentioned that at every step in the process the product of each department is carefully inspected before it is accepted by the next department. In this way the highest standard of work is maintained throughout the whole process of manufacture.

We need refer to the packing and despatching department only to say that the freedom with which the packers are able to handle lamps, and the express rate at which lamps are rolled up in their cartons by piece-work hands, is sufficient to show that the days of fragility of tungsten lamps are over.

Our readers will have gathered some idea as to the magnitude of the works from the description we have given of the main processes involved in the manufacture of Osram lamps and the large number for which it has been found economical to employ automatic machines. With the additions which were completed last spring, the works will be capable of dealing with an output of between 12,000,000 and 14,000,000 lamps per annum.

This article would not be complete without mentioning half-watt lamps. The installation of plant for the manufacture of these had just been completed and put into operation when the war broke out. We are informed that owing to the dislocation of labour caused by a large percentage of the staff and employees

enlisting, it was found necessary to concentrate all the available hands upon the production of the ordinary types of tungsten lamp, and the manufacture of half-watt lamps could not be begun immediately. It is confidently expected that this department will be in full swing within a month or two.

### THE B.E.A.M.A. AND THE WAR

ON September 4th the Council of the British Electrical and Allied Manufacturers' Association passed the following resolutions:—

1.—Resolved that, having regard to the state of war, it is the opinion of this Council that trading with—

(1) Any company incorporated in Great Britain the controlling interest in the share capital of which is held by Germans or Austrians,

(2) Any German or Austrian firm, or branch or agency of a German or Austrian firm, trading here, whether in the same or another name, is against the best interests of the British electrical and allied industries.

2. Resolved that the Secretary be and he is hereby instructed to invite members of the Association who fall under Definitions (1) or (2) in the first resolution to resign their membership.

3.—Resolved that members of the Association be instructed that, in the opinion of this Council, it is against national interests for them to buy from or sell to firms falling under Definitions (1) or (2) in the first resolution.

Copies of these resolutions were sent to Members and Associates of the Association; and Members, that is to say manufacturers in this country, were asked to state by September 9th whether they "assented to" these resolutions. This appears to be the usual practice of the B.E.A.M.A., and we understand that such resolutions are not considered effective unless there is a majority of members in favour of them. We duly received information of this action of the Council and had copies of the resolutions before us, and on September 9th, at the last moment before going to press with our issue of September 10th, we communicated with the Secretary of the B.E.A.M.A. We were told that the voting would not be considered by the Council for several days; and we were asked not to publish the resolutions in the meantime. Although we naturally complied with this reasonable request, we regret to say that our contemporaries, the *Electrical Review* and the *Electrical Times*, to whom a similar request had been made by the Secretary, published the resolutions nevertheless. This is the more regrettable as the resolutions have now not been confirmed, and in the circumstances no good object could have been served in making them public, and extending a somewhat bitter controversy outside the circle of the Association itself.

We have reason to know that the B.E.A.M.A. had been in constant communication with the Board of Trade as to the interpretation to be placed upon the first proclamation by the Government as to trading with the enemy, and, as no definite pronouncement could be obtained from them, the above resolutions were passed after Counsel's opinion had been taken. Although we understand that a large proportion of the membership were in favour of the steps indicated in them, there was considerable expression of opinion against any such action being taken against firms with works in this country. The Board of Trade were also informed of the B.E.A.M.A. Council's recommendations, and we have reason to believe that a broad hint was given that the Board would not approve of any combined boycott of firms manufacturing in this country with German capital. This is hardly to be wondered at, for two reasons. There would be great distress if large works had suddenly to close and a large number of workpeople were thrown out of employment almost without warning; and some of the works in question are at present engaged in executing Government contracts.

On Friday, September 11th, the B.E.A.M.A. issued a state-

ment that in view of the Government Proclamation dated September 9th (published in our last issue), and of "representations" made to them—representations which we need hardly suggest have emanated from a far higher authority than that of our two contemporaries already alluded to—they felt justified in modifying their previous resolutions, in favour of companies which largely manufacture here, as distinct from those which are merely branches (whether incorporated in Great Britain or not) of concerns domiciled in an enemy country. This distinction, the statement adds, "gives effect to the dominant feeling of members."

The Council of the Association certainly made a *faux pas* in passing resolutions or in making definite recommendations in so serious a matter, upon what they evidently regarded as a highly controversial question and upon which they desired to have a vote from their members before deciding on a definite policy. Bitter feeling has been aroused and the B.E.A.M.A. is divided into two camps, and nevertheless the position is practically "as you were," with one exception. This exception, however, is an acceptable one, namely, that firms in which the controlling interest is held in Germany or Austria must cease their connection with the Association and its members *unless they manufacture largely in this country*. The result might, however, have been brought about without all this pother.

It is to be regretted that the B.E.A.M.A. could not go further and put the whole thing on a sensible and logical basis by issuing a list of the firms barred. Apparently they do not consider this comes within their province, or they are afraid of legal consequences if they issued a "black list."

We have received for publication a long letter from Stafford, signed by twelve workmen employed by Messrs. Siemens Bros. Dynamo Works, all members of trade societies. We publish it below in slightly abbreviated form.

We, being representatives of organised workers employed by Messrs. Siemens Bros. Dynamo Works, Ltd., Stafford, desire to call public attention to a few facts concerning this company, which has lately been subject to malicious attacks from various sources, the same tending to damage the future trade of this old-established firm, founded about the year 1847 A.D. by Sir William Siemens, who was the pioneer of a new industry, which has since reached large dimensions.

At the outbreak of the present hostilities, many of our fellow British workers were called up for service, and the dependants of these men are being supported by the firm in such a manner that the fear of want has been dispelled; in many cases this help amounts to full wages allowance.

The works have been kept on full time up to the present in spite of many difficulties, and the management are doing their utmost to continue these acceptable conditions. Great encouragement has been given to the young men to enlist in the new army, and some hundreds have responded. All men who are serving are having their situations kept open for them. The feelings of these men could be better imagined than described if, on their return, after enduring the privations of warfare, they found the gate of their old firm closed.

In normal times about 2,000 workpeople are employed at these Stafford works, out of which are approximately 4 per cent. foreigners, comprising Germans who have grown grey in the service of the firm, others born in England, and a good number of other nationalities not alien enemies.

It has also been stated in reference to Siemens that Germany benefits to the extent of £35,000 annually in profits without any corresponding advantage to this country; seeing that the company pay quite £100,000 per annum in wages at their Stafford works alone, is not this a decided counter availing advantage?

We would urge all Corporations and other public bodies to consider these facts before letting prejudice interfere with the welfare of the British workers.

**Electro-Harmonic Society.**—The usual programme of smoking concerts and ladies' nights has been arranged for 1914-15. The first smoking concert is on Friday, October 9th, and the ladies' night on Monday, November 16th.

**Birmingham & District Electric Club.**—The next monthly meeting will be held at the Swan Hotel, New Street, Birmingham, on Saturday next, at 7 p.m., when a discussion will take place on "The Effect of the War on the Electrical Trade."



## THE EDISWAN WORKS

THROUGH the courtesy of Mr. C. E. Hunter and Mr. E. Gimmingham, the Managing Directors, we have been afforded an opportunity of visiting the

various works in the United Kingdom, these are the only ones in which every part of the manufacture is carried out, including not merely the assembly of the lamps, but also the blowing of the bulbs, the preparation of the tungsten and drawing the filament, and making the lamp caps. About 2,500 hands are employed there—about 1,400 in the manufacture of

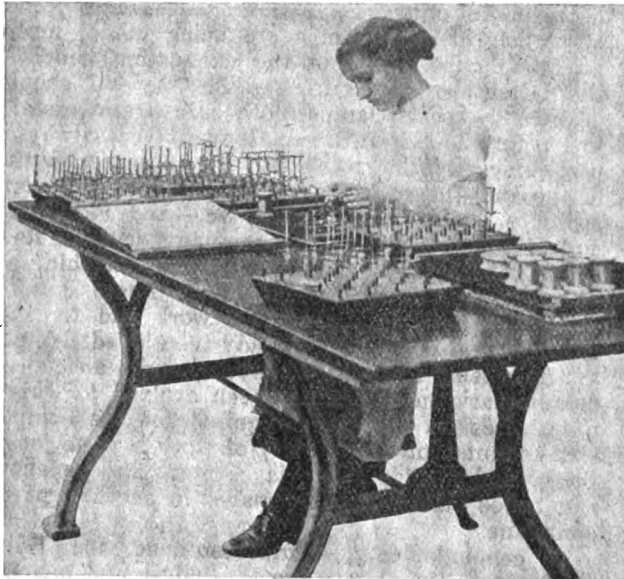


FIG. 1.—WINDING THE FILAMENT.



FIG. 4.—EXHAUSTING METAL FILAMENT LAMPS.



FIG. 2.—SEALING-IN.



FIG. 5.—VIEW IN ONE OF THE MAIN ASSEMBLING SHOPS.



FIG. 3.—EXHAUSTING RADIATOR LAMPS.



FIG. 6.—ONE OF THE ACCESSORY ASSEMBLING SHOPS.

works of the Edison and Swan United Electric Light Co. at Ponder's End, and of viewing the whole process of manufacturing metal filament lamps there. Of the

lamps and the remainder in the departments devoted to fittings, accessories, &c. Every department seemed as busy as it could be. We first inspected the labora-



tory, and we were interested to learn that tungsten can be prepared from a tungsten concentrate obtainable in Cornwall, so that it is possible to be absolutely independent even of imported raw material for lamp manufacture. Molybdenum, used for one of the two spiders of flexible wires supporting the filament, is also made at the works, and although these two metals—owing to the fineness of the wires required—are only used in comparatively small quantities, so that it may



FIG. 7.—FOUNDRY.

not always be worth while to make them there, the great point is that, by being able to do so, the works can be quite independent of outside assistance.

The glass-blowing was referred to, and the glass-houses illustrated, in our issue of August 27th. It is remarkable how simple this skilled operation appears. The molten glass is collected at the end of a long rod, and blown by the mouth until the bulb commences to form. This is then placed in an iron mould previously wetted with water, and the bulb blown to shape. The cushion of steam between the glass and the mould prevents actual contact with the iron. The bulb is then removed from the rod, and the operation is repeated; it takes only a few seconds. To keep pace with the increasing demand for lamps, an additional glass-house is being erected, and will shortly be in use.

Some of our illustrations show other processes in the course of manufacture. The operator in Fig. 1 is winding the filament on the supporting hooks after the foot and the stem with the leading-in wires and sup-

into the bulb, and Fig. 4 illustrates the next process, that of exhausting the bulb. Fig. 5 gives an idea of the large number of workgirls employed at each of the various operations; it is part of one of the main assembling shops.

We have only space to refer briefly to the other departments of the Ediswan works. Large quantities of carbon filament lamps are being made, including radiator lamps. Two of the exhausting benches for the latter are shown in Fig. 8. Several shops are devoted to special lamps, both carbon and metal filament, for the Edison Swan Company has always paid particular attention to these. Fig. 6 is a view of one of the shops devoted to the assembly of accessories—switches, ceiling roses, fuses, &c.—and Fig. 7 is one end of the foundry. The company does all its own casting, both brass and iron. In the machine shops it possesses some of the very finest automatic machines, both for light brass work and for miscellaneous steel parts. As already mentioned, lamp caps are now being made at the works, and a special series of automatic machines has been evolved for this purpose. Besides the parts required for the company's own manufactures, a variety of work is done for other firms, and a wide range is covered; in one shop we saw coffee machines being made; in another, parts for aeroplanes.

To conclude, in one brief sentence, the Ediswan works is at the same time the oldest and one of the most modern and complete lamp works in this country.

## ELECTRIC VEHICLES

At a recent meeting of the Electric Vehicles Committee it was decided to issue a quarterly official journal, which will be sent free to municipal and other authorities, and supply departments will be able to purchase further copies for distribution. A series of advertising cards is also being prepared.

The Committee has now issued details of the design of the concentric charging plug which they have submitted to the International Electrotechnical Commission with a recommendation for its standardisation. Sections of the plug and receptacle are shown in Fig. 1, with full dimensions. The outside contact is to be used as positive and the inside negative. The terminals are to be large enough to receive 0.15 sq. in. cable, and are to be marked + and -. It is recommended that the receptacle on the car be placed under the driver's seat, so that he cannot take his seat before the plug is withdrawn. The rated capacity of the apparatus is 150-amperes, but currents up to 300 amperes may be dealt

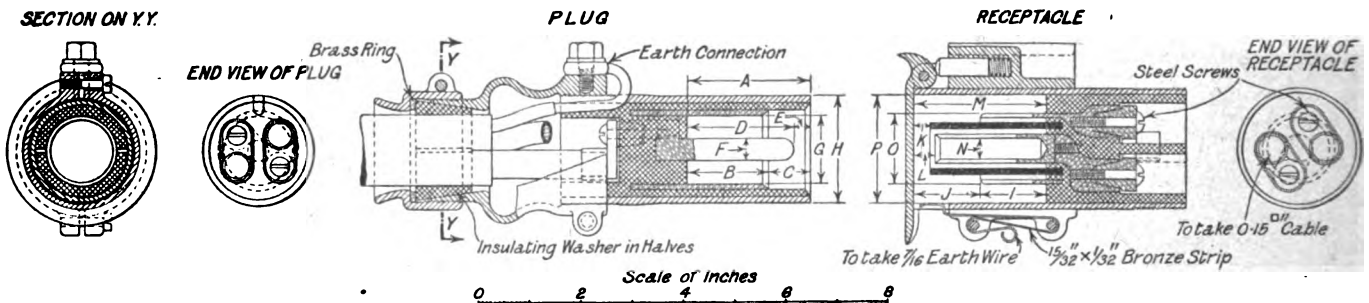


FIG. 1.—DETAILS OF STANDARD CHARGING PLUG AND RECEPTACLE.

Table of dimensions for 150-ampere size.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N Machine.	N Spring.	O Machine.	O Spring.	P
ins.	2 $\frac{3}{8}$	1 $\frac{9}{16}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$	$\frac{5}{8}$	0.435 0.437	1.406 1.408	2.10	1 $\frac{1}{2}$	1 $\frac{5}{8}$	$\frac{1}{8}$	$\frac{7}{8}$	2 $\frac{3}{8}$	0.437 0.439	0.422 0.427	1.404 1.406	1.416 1.421	2 $\frac{3}{8}$
mm.	60.33	39.69	20.64	52.39	7.94	11.04 11.10	35.71 35.76	53.34	35.72	33.34	7.94	11.11	69.06	11.10 11.15	10.72 10.31	35.66 35.71	35.97 36.09	53.98

porting spiders are complete in one piece. Among the various operations which struck us particularly was the pressing of the two flanges on the stem itself, which is done with great rapidity by an ingenious machine which is served only by one girl. Fig. 2 shows one of the sealing-in machines, for sealing the wound stem

with for short boosting charges. The earthing arrangement is clearly shown on the drawing, and the earthing conductor in the flexible cable should be equivalent to 7/16 S.W.G. The shells of both plug and receptacle are to be of mild steel tube, the bracket and cap of malleable cast-iron, and the contacts of gun-metal. Two alternative sizes of terminals and cable grips are recommended for standardisation, viz.,

for main conductors 1.10 sq. in. (overall diameter of three-core cable 1.5 in.) and 0.075 sq. in. (overall diameter 1.31 in.). The larger size is for Edison batteries requiring heavy boosting charges, and the smaller for lead batteries. It is recommended that "cab-tyre" sheathing be employed on the flexible cable. Further details are contained in a complete specification obtainable from the Committee. An example of a plug and receptacle made in accordance with the Committee's specification by A. Reyrolle & Co. (Hebburn-on-Tyne) is shown in Fig. 2.

It has been decided by the Committee to appeal for funds for carrying on its work from electric supply authorities and manufacturers, and over £100 has already been received in this way. A standard design of sign for charging stations has been approved.

As to the measuring instruments which should be fitted to

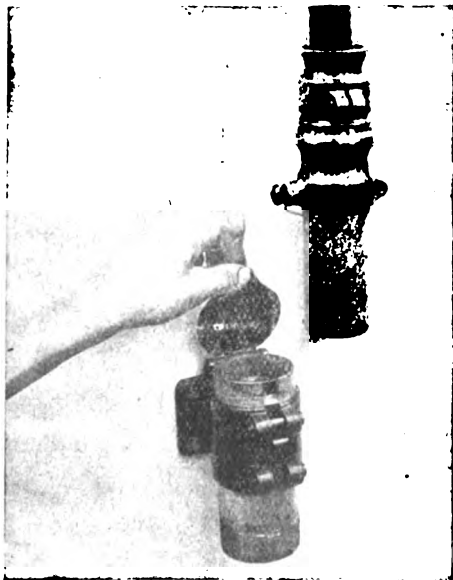


FIG. 2.—REYROLLE CHARGING PLUG.

electric vehicles, the Committee are of opinion that in the case of lead batteries both a voltmeter and an ammeter should be provided. Where, however, the battery is not removed for charging, and in cases where no constant attendance is provided during this operation, it is recommended that an ampere-hour meter should be provided, in addition to the ammeter, with provision for automatically opening the circuit when the battery is fully charged. In the case of batteries of the Edison type, an ampere-hour meter is the only instrument which need be provided. The Committee consider also that a mileage recorder is a necessary accessory for judging the condition of the battery in conjunction with the electrical instruments, and for preserving accurate records of the working of the vehicle. The Committee have been informed that mounting these instruments direct on the dash-board has not proved satisfactory hitherto, and the latest practice in America is to have them fixed on a strong steel pillar well in view of the driver, and distinct from the dash-board.

## ELECTRIC TRACTION NOTES

The Board of Trade Report upon accidents on railways in the United Kingdom during 1913 draws special attention to the use of electricity in preference to gas in railway carriages, and also to the necessity for adopting means to safeguard against mistakes by signalmen and drivers. Regarding the latter, a memorandum was prepared towards the end of last year by the inspecting officers and submitted to the various railway companies urging them to extend the use of electric track signalling in connection with the control of signals or block instruments, and to carry out combined experiments with different systems of cab signalling and automatic control with the object of supplementing the present system of semaphore signalling. The inspectors hold the view that some such system as cab signalling, or wireless or inductive control, should be generally adopted in the future, whilst the inspectors are now insisting upon the use of the track-circuit system in regard to new works where the traffic is dense, or there is a frequent service of express trains. On the question of train lighting some of the larger companies have

adopted the Board's suggestion of substituting electricity for gas on main-line and express trains, but the proportion of rolling stock of the sixteen chief companies lighted by electricity is still not more than one-fifth. As is known, a large proportion of the rolling stock used for suburban traffic is lighted by electricity.

## OPENINGS FOR THE EXTENSION OF OUR ELECTRICAL EXPORT TRADE

IN our issues for August 27th, page 475, and September 3rd, page 485, we went, in some detail, into the openings for the extension of our electrical export trade, which the cessation of German exports since the commencement of the war has rendered possible.

From subsequent information furnished by the Board of Trade Intelligence Department it appears that applications have been received from inquirers desirous of purchasing the following: Batteries, carbons, bells and pushes, lighting and accessories, corrugated iron cases for transformers, insulating links for switches, general fittings, dynamos and motors for automobiles, zinc cells, brass caps for flash lamps, celluloid cases, enamelled copper wire, magnets, magnetos, papier-mâché covers, vulcanite mouldings, incandescent lamps, arc-lamp carbons, vessels for electric accumulators, china and earthenware for electric fittings, machinery for making electric lamps, iron cases for transformers, electrical fittings, copper-coated steel wire for turbine blades. Application for names should be made to 73 Basinghall Street, E.C.

H.M. Consul at Milan has, since the outbreak of the war, received inquiries from Italian firms who have hitherto received the following classes of goods from Germany, but are now anxious to buy or import British products. These goods include all classes of electrical machinery, telephone material, and arc-lamp carbons.

H.M. Consul at Rio de Janeiro points out that the present condition of affairs affords British firms an excellent opportunity of securing much of the business hitherto handled by German houses in that city. Among the principal articles of German import have been large quantities of electrical plant and fittings of every description, and particularly have certain German firms been doing a lucrative business in connection with hydro-electrical installations. The necessity for giving long credit and also for sending representatives with a good knowledge of Portuguese to Brazil is emphasised.

## THE UNIVERSITY AND TECHNICAL COLLEGE ANNOUNCEMENTS

THE day classes at the Northampton Polytechnic Institute commence on September 28th. The evening courses commence on September 21st, and the important departure made a year ago by the introduction, as part of the regular courses, of lectures by specialists in various subjects is to be developed. Thus in the electrical engineering department there will be advanced lectures on "Transformer Design," by Mr. W. C. Kennett, and on "Electrical Instruments and Switchgear," by Mr. A. C. Heap.

The Manchester Municipal School of Technology commences its part time (evening and apprentices day) courses on Monday, September 28th. These include electrical and mechanical engineering, mining, &c.

A Proctor Baker Scholarship, tenable in the Faculty of Engineering, at the University of Bristol, has been awarded by the Society of Merchant Venturers to Mr. D. A. Gough. Merchant Venturers' Scholarships, also tenable in the Faculty of Engineering, have been awarded to Mr. E. S. Britton, Mr. E. A. Cockett, Mr. H. C. Collis. Messrs. F. H. Bulloch, H. H. Stewart, and A. Viswanath have passed the supplementary intermediate examination for the B.Sc. in engineering, and Mr. C. W. Taunton has passed the supplementary examination for the certificate in engineering.

The course of study in electrical engineering, extending over three or four years, at King's College, begins on Wednesday, September 30th. Among the special lectures arranged are the following:—"Electrical Engineering with reference to its Commercial Aspect," by J. S. Highfield, ten lectures, commencing October 4th; "Central Station Practice in its Relation to Legislative Enactments," by C. H. Wordingham, ten lectures, commencing January 15th, 1915.

**Telegraph Notes.**—Communication with the Republic of Colombia was restored on the 16th inst.—The Ottoman Government has prohibited the use of wireless on ships in territorial waters.—The Norwegian Government has put into force Article 8 of the Telegraph Convention regarding restrictions of service, and the Portuguese Colonial Minister has prohibited the use of secret language in telegrams to Huila in Angola or transiting *via* that place.—Messages must be written in plain Portuguese, French, or English.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,410.

Please explain fully why, with three single-phase transformers connected "star-star," it is impracticable to take any load between phases and neutral on the secondary side. What effect has the earthing of the neutral point of the primary windings on this?—"POWER."

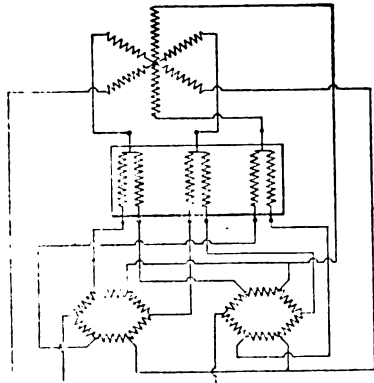
(Replies must be received not later than first post Thursday, October 1st.)

### ANSWERS TO No. 1,408.

It is desired to run two rotary converters in parallel from an A.C. generator with a single winding. An essential part of the scheme being that each rotary can be started or stopped independently of the other. As part of the generator output is required for transmission purposes, two separate windings, one for each rotary, cannot be considered. The D.C. output is required for lighting or traction. Would it be necessary to use a transformer or reactance with one rotary, or would it be possible to run the rotaries in parallel on both A.C. and D.C. ends? If the latter scheme is undesirable, as seems to be the case, what are the reasons?—"ROTARY."

The first award (10s.) is given to E. P. HOLLIS, whose reply in a slightly abbreviated form is given below:—

When first it was attempted to operate rotary converters in parallel on both the alternating and the continuous-current sides, difficulties were met, with the result that up to quite recently no attempt has been made so to operate converters. When a number of rotary converters are connected in parallel on their alternating and continuous-current sides, there exists between



TWO ROTARY CONVERTERS SUPPLIED FROM ONE SIX-PHASE GENERATOR. CURRENTS BALANCED BY MEANS OF PATENT BALANCING COILS.

each phase bus-bar and the continuous-current bus-bars a number of parallel paths of low resistance. The resistance of these paths is made up of the resistances of the connections, converter armature, and the brush resistance. The total is low, but the brush resistance composes a large part of the whole, and is a variable quantity. The current distributes itself according to the resistance of each circuit, and it is found that uneven

distribution of the current takes place. One finds that the positive side of one converter is often feeding very much more than the negative side of the same converter, possibly throwing a large overload on to another converter in parallel with which it is working, and bad parallel running results.

In the early days, when rotary converters had only to be operated from transformers, and not direct from generators, the difficulty was easy of solution, and it has become a standard practice to feed each rotary converter from a separate transformer or to feed a group of rotary converters from separate secondary windings of a transformer with one primary. Recently, however, another circumstance has raised itself which has again brought under consideration this characteristic of rotary converters, namely, the operation of rotary converters in parallel direct from a turbo-generator alternator, where a continuous-current turbo-generator is not practicable. In this case the alternating-current generators supply low-pressure, six-phase current. It is preferable that each turbo-generator be provided with at least two rotary converters, but the result is that the old problem of parallel running is again raised. The obvious solution was that which served satisfactorily in the case of the transformer, namely, to give the turbo-generator two windings. In many cases this introduces no difficulties, but, as is suggested in the question, sometimes other circumstances make two windings undesirable. To eliminate the two windings, a method has been patented (Patent No. 11,905/13 of A. H. Railing and C. C. Garrard) which provides a satisfactory solution. In this method, differentially wound balancing transformers are inserted in the low-tension A.C. leads of the rotary converters, as shown in the diagram in the figure. These balancing transformers consist of two windings on the same core, and one transformer is inserted in each of the three phases of the three-phase rotary converters or for six-phase rotary converters, as shown in the diagram. The two coils of each transformer are wound in opposite directions, and the alternating current supplying one phase of one converter is passed through one coil, and that of the same phase for the other converter is passed through the second coil. Consequently, when the currents are equal they cancel out, but should one converter attempt to take more than its share of the load, the excess of current magnetises the core and induces an electromotive force in the other winding, which assists the current flowing therein, and tends to cause that current to increase until the two currents flowing are again equal. In this way the loads taken by the rotary converters are equalised, and the unbalancing of current brought about by the circumstances related is entirely obviated. Any number of rotary converters can be operated in parallel on this principle, and, in addition, it would be possible to take part of the generator output for transmission purposes, as suggested in the question. [Mr. Hollis also encloses photographs of balancing coils made for this purpose.]

The second award (5s.) is made to E. P. HILL, who writes as follows:—

The point at issue consists in the possibility or otherwise of installing two rotary converters to obtain independent lighting or traction service (alternatively with parallel running) without providing each rotary with a separate transformer or reactances. As part of the supply is required for transmission, the generator is probably a high-voltage alternator, and a transformer is requisite in any case for the rotary supply, and the difference in cost between two separate transformers and one large one is small compared with the increased reliability obtained. On the assumption, however, that for some reason the alternator is a low-voltage machine, there are several practical considerations which decide the best course to adopt in any particular instance.

Modern rotaries are usually multiphase, very generally six-phase, machines on account of the lower heating losses and better commutating qualities. This in itself necessitates the intermediary of transformer, and will be found a good investment in the long run. Again, as the machines are to be over-compounded, the reactance necessary to obtain this is best obtained by adapting the leakage of the transformer for the purpose. The question of starting is very conveniently accomplished by a low-voltage tapping on the transformer which will allow rotary to run up and fall into synchronism automatically. The result of unfortunate experience in the attempt at parallel running of rotaries at both ends direct from an alternator or off one bank of transformers has caused the practice to be avoided. Among other disadvantages is that the load does not divide evenly between positive arms or negative arms respectively, commutating conditions become bad, and sparking develops. Compound

rotaries, unless carefully damped, would tend to shunt badly if run as proposed, with deleterious effects on commutation. Should a full control of power-factor be required in the proposed scheme, a booster with shunt and series windings will give best results and enable a good regulation to be obtained on transformer. This booster between slip-rings and rotary winding is the standard arrangement in Great Britain for corporation supply where either lighting or traction has to be provided for on one rotary. Provision is often made to reverse the series winding on lighting to obtain a drooping characteristic.

## ANSWERS TO No. 1,406.

"Doubtful," who put this question, writes that he has tried, with success, a simpler solution than is advocated in the answers which we published in our issue of September 10th. He has cut out the series winding and employed separate excitation of the shunt windings, without further alteration. He thinks that the good results have been due to the compounding action of the interpole windings. "Doubtful" has been fortunate that this treatment answered in the case of his machine; in many machines he would have experienced commutation troubles and bad regulation.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published September 17th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

**26,367/13. Carbon Holders for Arc Lamps.** H. AYRTON. The improved holders have for their object the enabling of the carbons to be turned down to a very short length without damage to the metal-work of the holder. In one form a screen of carbon or other material is used between the electrode and the holder, and in another pattern the electrode is drilled out to receive a part of the holder. Seven figures.

**29,070/13. Electrically Heated Utensils.** W. F. PERRY and CRENDEN CONDUITS, LTD. The base of the vessel is stamped with ridges and depressions which give it strength, while affording in the latter accommodation for the strip heating elements. Four figures.

**29,165/13. Telephony.** A. S. J. VAN KESTEREN. A telephone system employing repeaters for strengthening the current waves, and having a separate line for conversation in each direction. These two lines are connected at the ends to each other, and also to wires going to each subscriber's station, the latter connections being either positive or inductive, while the damping in the lines between the two points of connection is equal to or greater than the total strengthening produced by the repeaters.

**1,252/14. Metal Filament Lamps.** G. M. J. MACKAY. This specification relates to the use of phosphorous pentoxide within the exhausted bulbs of the lamps to prevent blackening. One figure.

**2,118/14. Electric Cooker.** G. PATE and A. R. WOOD (Carron Co.). This grillor comprises a carcase with upright sides formed with runners, and a rack. The heating element is slid into one pair of runners, and the grill pan is supported by another pair. Five figures.

**12,641/14. Traction Motor.** N. W. STORER. The motor is for high-tension continuous current, and has two armatures side by side in a rectangular case with inwardly projecting poles; each has two main poles, one commutating pole and one compensating winding. Two figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these patents will appear in our next issue.

**Arc Lamps:** GRAY and BEST [Arc lamps] 6,350/14.

**Distributing Systems, Insulating Materials, &c.:** HOWARD [Tiles for protecting cables] 21,446/13; LEACH and JOEL [Insulation] 26,149/13; RAFFI [Insulators] 13,784/14.

**Dynamos, Motors, and Transformers:** MENSFORTH [Dynamos] 22,149/13; A. G. BROWN BOVERI ET CIE. [Starting transformers] 12,012/14.

**Electrochemistry:** NIBLETT [Electrolytic apparatus] 24,559/13.

**Switchgear, Fuses and Fittings:** RICHMOND [Time switches] 19,676/13; ALDOUS & CAMPBELL, LTD., and ARCHER [Switches] 21,678/13; MARVIN [Motor control] 24,949/13; ENGELKE and BLOODWORTH [Adjustable resistances] 26,361/13; FINCATO [Re-

gulators] 1,238/14; SHEWARD [Fittings] 1,691/14; IGRANTO ELECTRIC Co. (Cutler Hammer Mfg. Co.) [Fluid rheostats] 1,786/14.

**Telephony and Telegraphy:** JOHNSON [Telephone exchange system] 20,011/13; ARNTZENIUS [Junction line and order wire working] 21,735/13; NEW PHONOPORE TELEPHONE Co. and NICHOLSON [Selective signalling] 27,018/13; FLEMING [High frequency generator] 3,963/14; BETULANDER and PALMGREN [Automatic selector] 16,619/14.

**Traction:** PECKHAM and THOMAS [Automatic tramway brake adjuster] 19,842/13; HARPER [Signalling] 21,428/13; ROMNS [Supporting tramway rails] 22,609/13; WELSH [Trolley wheels] 26,198/13; PEACOCK [Signalling] 26,638/13.

**Miscellaneous:** BARTRUM [Synchronising clocks] 12,432/13; CROSBEE, CROSBEE and ROGERS [Contacts for electric horns] 19,965/13; BLAKE [Vehicle for cable drums] 20,325/13; CLERC [Electric clocks] 25,977/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Instruments:** LEEDS [Potentiometers] 19,283/14.

**Telegraphy:** ROBERTS [Wireless receiver] 19,054/14.

**Miscellaneous:** BUNTE and REMMLER [Vacuum cleaners] 17,628/14.

### Amendments Allowed

**12,082/13. Arc Lamps.** H. AYRTON. A correction of a clerical error has been made in this specification, which is for a means of adjustment of the negative electrode of projector lamps in addition to the feed mechanism.

**14,816/13. Telephone Exchanges.** S. CONNER and A. R. KAHL. This patent has been amended by way of disclaimer.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

**17,262/00. Electrolytic Meters.** A. WRIGHT and REASON MNE. Co. This patent covers the use of a mercury anode and a platinum cathode in electrolytic meters.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors and Transformers:** B. T.-H. Co. (G.E. Co., U.S.A.) [Voltage regulation] 11,535/05.

**Incandescent Lamps:** A. SWAN (G.E.C., U.S.A.) [Lamp caps] 12,739/02; W. SCHEURMANN [Exhausting pumps] 11,868/08.

**Switchgear, Fuses, and Fittings:** O. A. MYGATT [Reflectors] 10,662/09 and 13,082/09.

**Telephony and Telegraphy:** W. JUDD and A. FRASER [Electromagnetically controlled perforators] 12,458/02; MARCONI'S WIRELESS TELEGRAPH Co. and R. D. BANGAY [Condensers] 12,968/07.

**Traction:** T. VARNEY [Overhead conductors] 12,458/07.

**Miscellaneous:** MCNEIL and PEARSON FIRE ALARM, LTD. [Automatic fire alarms] 12,376/04; MARCONI'S WIRELESS TELEGRAPH Co. and R. D. BANGAY [Electromagnetic engine governor] 12,828/07; H. M. DARRAH and L. A. HACKETT [Sliding contacts] 11,758/08.

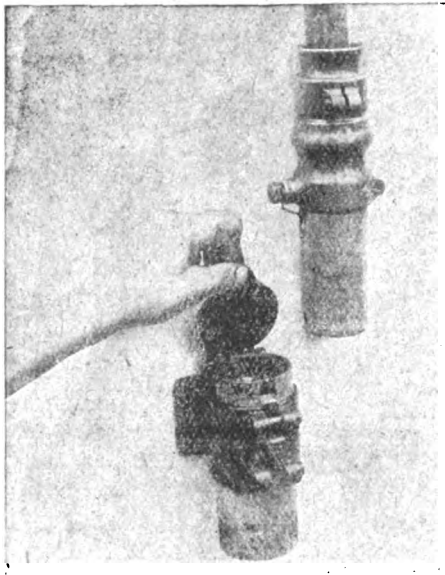
**The German Electrical Industry and the War.**—News has reached us *via* Switzerland that already at the end of last month an announcement was made by the A.E.G. that, in view of the shortage of hands due to the mobilisation, it was practically impossible to make any deliveries. Export was quite interrupted, and in such departments as that for large machines the few hands that were left were only working full time on three days a week, and five hours on the other three, but it had not been found necessary to discharge

hands on a large scale. In the departments where aero-planes and other war material are made, three shifts a day are being worked. It is also reported that the leading German firms, including the A.E.G., Siemens-Schuckert, and Bergmann, have withdrawn many existing price lists and announced in many departments increases in prices of 10 and 20 per cent. Probably the state of affairs has become materially worse since the information referred to was published.



# CHARGING PLUGS AND RECEPTACLES FOR ELECTRIC VEHICLES

TO THE  
ELECTRIC VEHICLE  
COMMITTEE'S  
STANDARD  
SPECIFICATION



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### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, the following may be taken as the official quotation for electrolytic copper bars, viz., £54 10s. to £55. (Last week £55 10s. to £56.)

**British Trade with Italy.**—H.M. Consul at Milan telegraphs that the British Chamber of Commerce there has received inquiries from local firms who are desirous of purchasing large quantities of British goods, including dynamos, motors, iron and steel goods, and general machinery.

**Colonial and Foreign Agencies.**—An electrical company in the Province of Quebec, whose representative will shortly be visiting this country, is open to represent United Kingdom manufacturers in the following goods:—A.C. motors; half-watt and other forms of lamp fittings; lampholders; cut-outs and fuses; house wires; cables and flexible cord for electric cooking and heating apparatus; and electric fans.

An electrical engineer in Christiania (Norway), reports H.M. Consul in that city, desires to secure the agency for Norway of United Kingdom manufacturers of general electrical goods.

Further particulars in both cases at 73 Basinghall Street, E.C.

**Scholey & Co., Ltd.**—This firm write to correct a false impression, emphasising that they are a British organisation in every sense of the word. Scholey is one of the oldest family names in Yorkshire, and there is no one on their Board or staff who is associated with any German or Austrian family.

**United Softeners, Ltd.**—The Company ask us to

announce that they have no connection with Germany, no interest is held by Germans, and all their products are British made. The Directors are A. O. Burton, L. A. Neel, and S. H. Menzies (British), V. Hjorth (Danish), and J. J. Lassen (Danish, naturalised in Great Britain).

**Contraband.**—A Royal Proclamation notifies that copper (unwrought) and magnetic iron ore will be treated as conditional contraband during the war or until further notice.

### APPOINTMENTS AND PERSONAL NOTES

At a meeting of the Council of the British Electrical and Allied Manufacturers' Association, held at the offices on the 17th inst., Mr. B. H. Antill, Director and Manager of Siemens Bros. Dynamo Works, Ltd., was elected a member of the Council, in place of Mr. C. Koettgen, resigned.

The name of Lord Guernsey appears on the list of the Officers of the Guards who have been killed in action in France. Lord Guernsey was Chairman of Duram, Ltd., in which business he took an active part. At the commencement of the war he was a Captain of Yeomanry, but immediately rejoined his old regiment, the Irish Guards, as Captain.

A Generating Engineer is required by the Hackney Electricity Department. Salary £120, rising to £150 per annum.

A temporary Charge Engineer is required at Wakefield. Salary £2 per week. Applications to City Electrical Engineer.

A Test-room Assistant is required temporarily during the war, at Leith. Salary 35s. per week. Applications to Burgh Electrical Engineer.

A cable jointer is required in the Hammersmith Electricity Department. (See advertisement on another page.)

## "ELECTRICAL ENGINEERING" TRADE SECTION

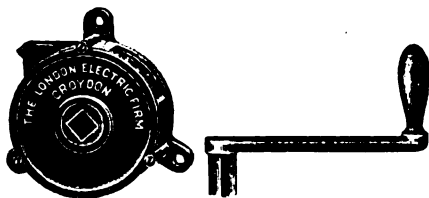
### NEW ELECTRIC LIGHT FITTINGS

**T**OWNSHEND'S ART METAL CO., LTD. (Ernest Street, Birmingham), whose electric heating apparatus is already well known to our readers, has issued an extremely attractive catalogue of electric light fittings. Our illustrations, which show two of the smaller ones, do not do justice to the effectiveness of the many new designs of fittings shown in the list, which contains some pretty examples of brackets, hall lanterns, electroliers, pendants, and table standards, all at very reasonable prices.



### NEW ARC LAMP WINCH

**O**UR illustration shows a new winch got out by the London Electric Firm (George Street, Croydon) to meet foreign competition. It is made in two sizes for large and small lamps, and is a very robust and reliable construction.



The designer has aimed at omitting the weak and embodying the strong points of existing patterns. The price is low, and those desiring a cheap winch need not buy a foreign-made article.

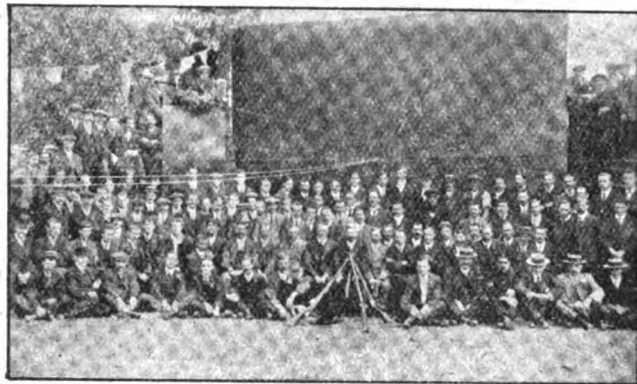
### ELECTRIC HEATERS

**W**E are informed by the Bastian Electric Heating Syndicate, Ltd. (185 Wardour Street, W.), that they are now taking orders for heaters of their well-known A type, in sizes up to 2 kw. As at present constructed the heater is fitted with six Vitrolite glowers of 333 watts capacity each, and a switch is provided to reduce the rate of consumption to 1.8 kw. In this construction the "Tabasco" resistance wire is wound as a perfectly close spiral around the exterior surface of a quartz tube, the convolutions being prevented from short-circuiting one another by the oxide on the wire itself. This construction had many advantages, including that of cheapness, which enable the firm to put these heaters

on the market at the moderate price of 80s. each. They inform us that they are, at the present time, more busy than they have ever been before at this season of the year, owing to large orders on hand for heating apparatus for his Majesty's warships.

### THE EDISWAN RIFLE RANGE

**W**E illustrate here the interesting scene of the opening of the rifle range established by the Edison & Swan United Electric Light Co., Ltd., on September 5th. Mr. J. W. Elliott, Lamp Sales Manager, fired the christening shot



OPENING OF THE EDISWAN RIFLE RANGE.

and declared the range open. The range is on the Co.'s own premises, and arrangements are made for 25, 50, 75 yds. range. A large active membership is shown in the illustration, but there are many who were unable to be at the opening. It is proposed by the Committee to cover in the range during the winter months.

### CORRESPONDENCE

To the Editor of ELECTRICAL ENGINEERING.

SIR,—The Corona Lamp Works are making distribution of a circular purporting to give information as to "who's who" in the lamp industry. They are evidently doing this with the intention of suggesting that practically every lamp firm, except their own, is a foreign firm. To further this idea they give the names of directors of various firms, always being very careful to give only the foreign-sounding names, to suggest German nationality. Their spirit of fairness, however, leads them totally to ignore the names of all directors, &c., who are obviously British. Their action is strange in view of the fact that in May last a judgment was obtained against them regarding large quantities of lamps imported by them from the Continent.—Yours truly, ATLANTIC.

London, September 22nd, 1914.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**CAB-TYRE SHEATHING.**—A very attractive coloured leaflet on the advantages of their "cab-tyre" type of sheathing for hand lamps and other portable apparatus, has been issued by the St. Helens Cable and Rubber Co., Ltd., Warrington. This imitates the style of an illuminated address, and is most effective.

**Electrical Drive for Textile Mills.**—A very important contract has been placed with the General Electric Co., Ltd., of Queen Street, Belfast, by the York Road branch of the York Street Flax Spinning Co., for an electrical plant for the individual driving of spinning frames. This is one of the first installations of its kind in Ireland. The entire equipment will be manufactured at the Witton Works (Birmingham) of the General Electric Co., Ltd.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Bispham.**—The Council is to ask for a loan of £8,155 for electric supply purposes.

**Colombia.**—Messrs. S. Pearson & Son, who have entered into a contract with the Colombian Government for the improvement of Cartagena, have undertaken to instal an electric lighting plant.

**Hornsey.**—Two rotary- or motor-converters are required. Borough Electrical Engineer. October 9th.

**Kelso.**—Negotiations are being carried on between the Council and the Gas Co. with a view to the latter installing electricity generating plant.

**Littleborough.**—Transformer kiosk with equipment, including mains, high- and low-tension cable, transformers and switch-gear. Consulting Engineer, W. C. C. Hawtayne, 9 Queen Street Place, London. October 12th. (See an advertisement on another page.)

**London: Woolwich.**—Sir John Snell has advised the Council to take immediate steps to obtain further plant as the estimated demands during the coming winter will absorb all the existing spare capacity. The Council has, in consequence, authorised the purchase of a 3,000-kw. turbo-alternator at an estimated cost of £10,000.

**Lowestoft.**—The Borough Electrical Engineer has called attention to the fact that the question of increased boiler plant will have to be considered before long. He points out that the floor space occupied by the dry back boiler at present can be made to give double the evaporation by the installation of a water-tube boiler, whilst with the old boiler out of the way a greater efficiency can be obtained from the others by installing induced draught.

**Troon.**—The Kilmarnock Council hopes to be in the position to give a supply in this district by November. Parliamentary powers have just been obtained.

### Wiring

**Sheffield.**—Extensions at City hospital. City Architect, October 7th.

**Birmingham.**—Public baths, George Arthur Road, Saltley. Architects, S. N. Cooke and Twist, 117 Colmore Row.

**Blackburn.**—Fire station (£31,600).

**Derby.**—Free library, Pear Tree Road. Architect, C. B. Sherwin, 32 St. Peter's Street.

**London: L.C.C.**—320 wiring points at the Vallance Road Schools, Mile End. Chief Engineer, October 8th. (See advertisement on another page.)

**Pontypridd.**—Electric lighting of Llwynpia Homes. Clerk to Guardians. October 18th.

**Stoke-on-Trent.**—Telephone and bell installation at the workhouse.

### Miscellaneous

**Leicester.**—Tramway extensions estimated to cost £29,898 are to be put in hand.

**Oban.**—The Borough Electrical Engineer has been instructed to proceed at once with the conversion of all existing gas lamps in the principal streets to electric lamps.

**West Ham.**—Three months' supply of electrical fittings for the Guardians. October 1st. Clerk, Union Road, Leytonstone, N.E.

**York.**—The Tramway Manager has been instructed to obtain quotations for two electric omnibuses.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Bexhill.**—The Borough Electrical Engineer has been instructed to purchase 500 Edison and Swan metal-filament lamps.

**London: H.M. Office of Works.**—A contract has been placed with Messrs. J. H. Tucker & Co. for the supply, during the next three years, of 5 and 10 ampere tumbler switches.

**Oldham.**—The following tenders have been received for a D.C. motor-generator:—General Electric Co.; Lancashire Dynamo and Motor Co. (accepted); Electric Construction Co.; British Thomson-Houston Co.; Bruce Peebles & Co.;

Mather & Platt; Electromotors, Ltd.; Brush Electrical Engineering Co.; Siemens Bros. Dynamo Works.

**Swinton.**—A tender by the Lancashire Electric Power Co. for street-lighting equipment, at £1,800, has been accepted.

**Wolverhampton.**—The tender of the Davenport Engineering Co. at £2,620 has been accepted for cooling towers at the generating station.

Messrs. Joseph Kaye & Sons have received an order from the War Office for the immediate delivery of 3,000 patent seamless oil-cans. They have just delivered to the Navy 7,000 of these cans.

## LOCAL NOTES

**Belfast: Proposed New Power Station.**—In our issue for July 2nd, page 392, we mentioned that Sir John Snell had reported upon the general position of the electricity undertaking in conjunction with Mr. W. J. Pratten, formerly Manager of the Engineering Department of Messrs. Harland & Woolf. At that time Sir John Snell had presented an interim report which recommended the purchase of a 1,000-kw. rotary-converter in order to help the department temporarily. Sir John Snell's full report, which is just to hand, advises the Corporation on no account to remodel or permanently extend the existing power station, but to proceed with the erection of a three-phase high-pressure system. We will deal with the matter in greater detail in our next issue.

**Bristol: Electricity Accounts.**—The annual report and accounts of the Electric Lighting Committee were presented at the last meeting of the Corporation. We gave details in our issue for July 23rd, p. 426. In presenting them Alderman Pearson said that there had been an increase in every branch of the department, and the undertaking had been successful not so much because of any special merit on the part of the Committee, but through the efforts of the officials, who were keenly alive to their duties. He regretted the necessity of having to curtail in some degree the arc lighting, due to the policy of this country buying in the cheapest market, which policy was working rather badly for us to-day, as it had resulted in the carbon manufacturing business going almost exclusively into the hands of Germany. The Corporation had four months' stock in hand, and he hoped this example would be a lesson to all of us, that there is an advantage in supporting home industries, even though we have to pay a little more for them.

**Dundee: Bulk Supply.**—The Tayside Electric and Gas Light Co. has asked the Corporation for terms for a supply of electricity in bulk to be distributed in Wormit. Some objection was taken at the last meeting of the Corporation, when it was announced that it would cost £3,000 to lay the cables. It was subsequently decided to offer current at the Dundee boundary, leaving it to the Tayside Co. to carry out the necessary transmission from there. The idea of the Company was to pay interest on the cables, and so much per unit. The scheme would involve carrying cables across the Tay Bridge, and Mr. Richardson expressed the opinion that it would be necessary to take two cables across in order to provide against the possibility of one breaking down.

**Edinburgh: Electric Supply Profits.**—In view of the special circumstances now existing the Electric Lighting Committee has agreed unanimously to recommend that the whole of the surplus last year on the undertaking shall be applied to the relief of rates. The sum available is over £3,000.

**Keighley: Criticism of Electricity Charges.**—During a discussion upon the accounts of the Corporation Gas Department last week, in which a decrease of nearly six million cubic feet in sales was recorded, the Chairman of the Gas Committee said that the loss was chiefly attributable to the practice of selling electricity for lighting in mills, &c., at power rates, a practice which, he said, could not be too strongly condemned as being a great source of loss to the Corporation and unprofitable to the electricity undertaking. The Chairman of the Electricity Committee, in replying, said he regarded the statement of the Chairman of the Gas Committee as a splendid compliment to the Electricity Department. The policy of the Electricity Department was not to charge their consumers more than the value given, and then give the profit back to those who did not take electricity—a hint to the Gas Department not to make large profits and give large sums to relief of rates.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 405 [VOL. X., No. 40]

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THURSDAY, OCTOBER 1, 1914.

[PRICE ONE PENNY.]

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## SUMMARY

AN account is given of the equipment of a rolling mill which has been converted from steam to electric drive. (Page 524.)

A PAPER by Dr. L. Guillet, which was to have been read at the autumn meeting of the Iron and Steel Institute, and dealt with the preparation of electrolytic iron, is published in abstract. (Page 524.)

A BOOK on Mining Electrical Engineering is reviewed. (Page 525.)

TWO electrometallurgical patent specifications of interest relating respectively to recovery of metal from solutions and electric zinc furnaces were published during last month. (Page 526.)

A SCHEME for defence by live wires is put forward in our Questions and Answers columns. (Page 526.)

AN article by Mr. E. P. Hill gives some useful points with regard to the starting of rotary converters. (Page 527.)

SIR JOHN SNELL and Mr. W. J. Pratten have both recommended the Belfast Corporation to erect a new three-phase high-tension power station in preference to extending the existing works. (Page 527.)

THE British Engineers' Association has protested to the Government against the terms of the "Trading with the Enemy" Proclamation, and urges that firms in this country having relations of any sort with Germany and Austria should be treated as alien enemies. (Page 528.)

THE Institution of Electrical Engineers has been carrying out practically all the work connected with the raising of five hundred men to serve in the Divisional

Engineer Units and Signal Company of the recently formed Royal Naval Division. The Institution has also been instrumental in obtaining temporary work in central stations for men out of employment ineligible for military service. (Page 528.)

EXPERIMENTS have been carried out at Hove with different types of trolley omnibuses. (Page 528.)

A METHOD of controlling fog signals by wireless is mentioned under Telephony and Telegraphy. (Page 528.)

AMONG the specifications published by the Patent Office last week is one for stranded steel commutator connectors for turbo-generators. Other subjects are thermal current regulators and searchlight lamps. Application has been made to suspend foreign patents for ignition devices and magnetic clutches. The patent for a thermo-galvanometer is expiring. (Page 529.)

OUR Trade Section contains illustrated descriptions of a cinema equipment and a recent form of electric heater. (Page 530.)

WE publish correspondence regarding the B.E.A.M.A. and the war, a letter from an Antwerp firm desiring agencies, and a statement as to supplies of arc lamp carbons from Switzerland. (Page 531.)

TURBO-ALTERNATORS, water-tube boilers, etc., are required at Colwyn Bay, and electric lamps at Stockport.—An electric lighting scheme is under consideration at Eastleigh.—Electrical fittings are required for an asylum at Edinburgh. (Page 531.)

THE Dewsbury Electricity Committee has refused to consider a bulk supply scheme from the Yorkshire Power Co.—Applications for sanction to erect overhead wires have been made by the York Corporation, the Blackrock Councils, and the Clevedon Electric Supply Co.—The domestic power demand in St. Anne's-on-Sea has doubled itself in the past twelve months.—There was a loss of £6,162 upon the Stoke-on-Trent electricity undertaking last year. (Page 532.)

AN 8 per cent. dividend is announced by the British Insulated & Helsby Cables, Ltd.; 6 per cent. by the British Electric Transformer Co. and by the British Aluminium Co.—on the preference shares in the latter case.—A satisfactory half-year's trading is reported by the Clyde Valley Electrical Power Co., but no dividend is announced. (Page 532.)

## TECHNICAL COLLEGE ANNOUNCEMENTS

A considerable number of scholarships are offered in connection with the trade schools of the London County Council. Application must be made to the Education Officer for entry forms (No. T2-258) not later than October 17th, and the examinations will be held in December.

WE have received a prospectus from the Electro-technical Bureau (Campfield Chambers, 312 Deansgate, Manchester), where correspondence courses in electrical engineering are conducted. The course, besides the general sections on continuous-current and alternating-current engineering, include special sections on electrochemistry, electric traction, electricity in mines, power-house working, and electrical machine design.



# ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Published on the First Thursday of each month

## AN ELECTRICALLY DRIVEN ROLLING MILL

NOT only is there a general tendency to equip every new rolling mill with an electric drive, but in many cases steam engines driving mills are being replaced by electric motors. In a recent example of a conversion from steam to electric drive, the mill was previously driven direct by a

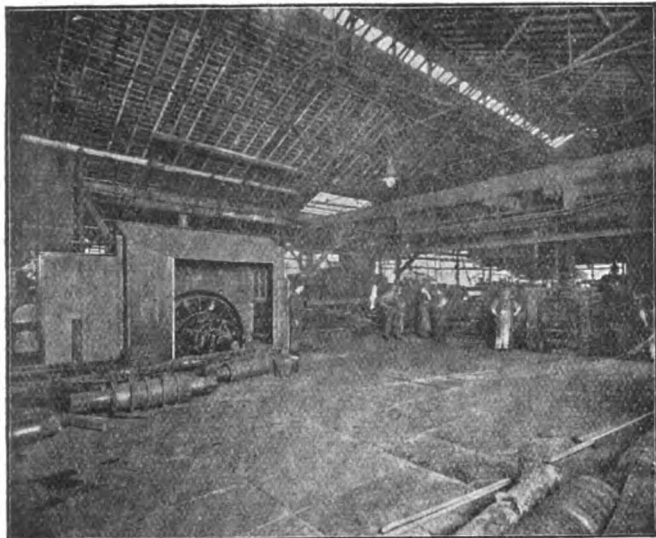


FIG. 1.—300 H.P. MOTOR DRIVING ROLLING MILL.

horizontal steam engine at about 60-70 r.p.m. It has three-high roughing rolls and two-high finishing rolls and guide train. The work consists in rolling iron and steel billets varying between 120 and 200 lb. weight down to flat rounds, &c.

To convert to electric drive, the steam engine was removed and replaced by a 30-ton flywheel, coupled to the mill shaft

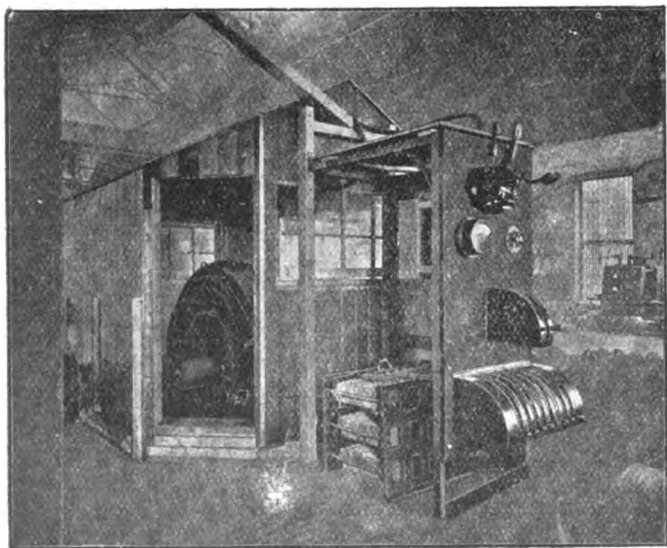


FIG. 2.—SWITCHGEAR AT REAR OF MOTOR HOUSE.

and rope-driven from a 500-volt continuous-current compound-wound "Witton" motor of 300 h.p., running at an average speed of about 220 r.p.m. To enable the flywheel to do its share of the work the motor was compounded so as to have approximately a 20 per cent. drop between no load and full load. As will be seen from the accompanying illustrations, Figs. 1 and 2, a light wooden motor-house was placed round

the motor, and one side was removed for the purpose of taking the photographs.

The motor is controlled by a switch panel from the rear of the house. This panel is provided with main switch, circuit-breaker, ammeter, speed regulator, and multiple switch starter. With the exception of the circuit-breaker, which is at the top of the board and out of reach, all the switchgear is fitted with protecting covers. The switchgear is interlocked, so that the circuit-breaker, switches, and starter must be operated in the correct sequence, whereby accidents are prevented. Any attempt to close the circuit-breaker after one of the starter switches has been closed is frustrated, so that the switchgear is completely mistake-proof. In addition to this switchgear a push-switch is provided near the rolls by which the motor can be stopped in an emergency.

One of the owners, speaking before an important engineering society, recently said:—

"There has not been a single hitch of any kind whatever, and the results were even more satisfactory than were anticipated. There had been great economy of floor space. . . . As a matter of fact, the electric drive occupied less than half the space of the previous steam engines. A great saving had also been made in the power consumed. Those engaged in the management of iron and steel works knew what power could be consumed by the screwing down of the screws in the housings to keep the rolls in position. It happened not at all infrequently that a steam engine could not start them because these screws were down so tight, and they had to be eased before the engine would start. The same thing applied equally to a motor, but it was possible to tell by the use of the ammeters what power was being used, and whether the men were looking after their work properly. . . . It was found (with the motor) that an increase of 20 per cent. in output was obtained . . . partly due to the greater regularity with which the train was driven, and further than that, the quality of the work was better, due to the more regular speed which gave a more regular size of bar rolled. There was also a considerable economy in the matter of labour and in lubricating materials."

The energy for driving this motor is generated from exhaust steam, so that the power is obtained very cheaply. The electrical plant driving this mill was supplied by the General Electric Co., Ltd. (Witton, Birmingham, and 67 Queen Victoria Street, London E.C.).

## ELECTROLYTIC IRON

AMONG the Papers which were to have been read at the autumn meeting of the Iron and Steel Institute was one by Dr. L. Guillet, of Paris, on the manufacture, properties, and uses of electrolytic iron. Although as far back as 1860 Klein in Petrograd used electrolytic iron for plates for printing bank-notes, and several subsequent experimenters developed processes for the preparation of electrolytic iron, it was not till lately that any emerged from the laboratory stage. Now, however, a commercial plant has been laid down by one or two French firms under the "Le Fer" patents. In this method a revolving cathode is used with a solution of iron salts maintained in the neutral state by circulation over the surface of the iron. The bath also receives periodic additions of a depolarising medium such as oxide of iron, the object of which is to eliminate, at least in part, the hydrogen deposits on the cathode, which injuriously affect the material if present in too large a quantity. By these means it is possible to work with a current of high density (1,000 amps. to the square metre), and an iron of excellent quality is obtained. The process is applicable either to the production of very pure iron, which can compete with best iron and Swedish iron, or to the direct manufacture of tubes and sheets in the finished state. Two tons of metal per kw.-year can be obtained, including current for all auxiliary purposes. At present the process is mainly used for making tubes round a mandrel which is easily withdrawn after annealing. At the works of Bouchayer and Viallet over 100 tubes four metres in length in sizes up to 200 mm. diameter can be turned out per day. When removed from the bath, the material is hard and brittle, and shows a peculiar microscopic structure, owing to interstrain and occluded gases, but after annealing

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at 800° to 900° C. shows normal micrographic structure, and can undergo deformation to an extraordinary degree without fracture. Its properties are discussed at some length in the Paper.

The industrial applications of electrolytic iron include, besides the manufacture of tubes and sheets, the preparation of pure iron as a raw material intended for fusion and rods of pure iron for autogenous welding. Tubes can be made without difficulty of a thickness of more than 6 mm., but for thinner tubes it is difficult to obtain a regular thickness. The tubes will stand high pressures exceedingly well. Plates suitable for stampings for electrical plant can be prepared of very high magnetic quality, compressive strength, and even thickness. A German authority has estimated that in transformers a saving in weight of 33 to 40 per cent. can be obtained by employing such material, and the capacity of A.C. motors can be increased by 50 per cent. and of D.C. motors by 16 per cent. These figures seem rather optimistic, and no mention is made of the ageing quality of the material. Electrolytic iron could compete successfully as regards quality with Swedish iron as a raw material for fusion, but its cost would probably work out at from £6 to £7 12s. per ton, according to the locality.

### REVIEW

**Electrical Practice in Collieries.** By D. Burns. 353 pp. 7½ in. by 5½ in. 172 figures. (London: Charles Griffin & Co., Ltd.) 4th edition. 7s. 6d. net; abroad, 8s. 2d.

This is the fourth edition of a work addressed to colliery managers, under-managers, engineers, and students, and gives a general survey of the electrical principles and applications of electrical power to colliery work. It does not pretend to go deep into highly specialised branches of the subject, and the very old-fashioned nature of some of the plant represented in the illustrations is not necessarily detrimental to the attainment of its object of conveying a general understanding of the matters treated of. In a subject advancing so rapidly as electrical colliery engineering it is probably easier to write a new book than to revise an old one, and despite the presence of some excellent new material there is a little lack of proportion, and here and there a little inconsistency in the result. Occasionally, too, the author has inadvertently left in descriptions of obsolete apparatus. The osmium lamp, for example, is mentioned as a modern metal-filament lamp; the types of arc lamp which are quite superseded still figure in the lighting section. Again, although the latest Home Office regulations are quite rightly included in the book, some of the illustrations, especially of haulage plants, show old open-type motors that could not possibly be allowed underground. We would also like to have seen modern types of colliery switchgear treated at much greater length. There is, however, much that is useful and practical in such chapters as those on motors, pumping, haulage, and coal cutting, the last of which is gone into pretty fully; but some of the best matter is hidden away in a regrettably short final chapter entitled "Miscellaneous Appliances," to which the most recent forms of electric miners' lamps, electrical shot-firing, and even main shaft winding are relegated.

**The Association of Mining Electrical Engineers.**—The Annual General Meeting of the Association will be held on Saturday next, at 4.30 p.m., at the Grand Hotel, Sheffield. The following are the nominations by the Council of Officers for the next session:—*President*, Mr. R. Holiday (Acton Hall Collieries); *Vice-Presidents*, Mr. A. Hall (Silverdale Co., Staffs.) and Mr. M. Brown (Banknock Coal Co., Glasgow); *Treasurer*, Mr. C. F. Jackson (Eshall Colliery, Nuneaton). The annual report records a membership of 1,170 among the ten branches of the Association, and the holding of many meetings for the reading and discussion of papers. At the examinations held last March, out of thirty-seven candidates thirty-one passed for first-class certificates, and all the remainder for second-class certificates. Finally, the report says: "The Association continues to make satisfactory progress in educational value and numerically, but the Council consider that the important work undertaken by the Association should receive much greater support from the Mining Industry."

**The Greenock Electrical Society.**—We have received a full programme of meetings for the ensuing session from the Greenock Electrical Society. Twenty meetings are arranged, the first of which is held to-day, when a paper on "Cottonopolis and its Electricity Supply" will be read by Mr. F. H. Whysall. The Honorary President of the Society is Mr. A. Robertson (Greenock and Port Glasgow Tramways Co.), and this year's President is Mr. D. McDougall (Greenock Corporation Electricity Department). There are over 130 members.

## MINING AND METALLURGICAL PATENTS OF SEPTEMBER

NO specifications of special interest to mining electrical engineers have been published by the Patent Office during the past month, but the following two deal with applications of electricity in the metal industries. In No. 19,669 of 1913, V. C. Tainton and M. F. L. A. Aymard (South Africa) describe an apparatus for electrolytically recovering metals from solutions, with a specially constructed filtering diaphragm composed of finely divided conducting material arranged on a conducting frame. The other specification is No. 10,061 of 1914, in which A. L. J. Queneau (Jemappes, Belgium) describes an improved electric furnace for the reduction of zinc, provided with condensers in the walls consisting of rows of pipes mounted at a suitable inclination.

### QUESTIONS AND ANSWERS BY PRACTICAL MEN

#### RULES.

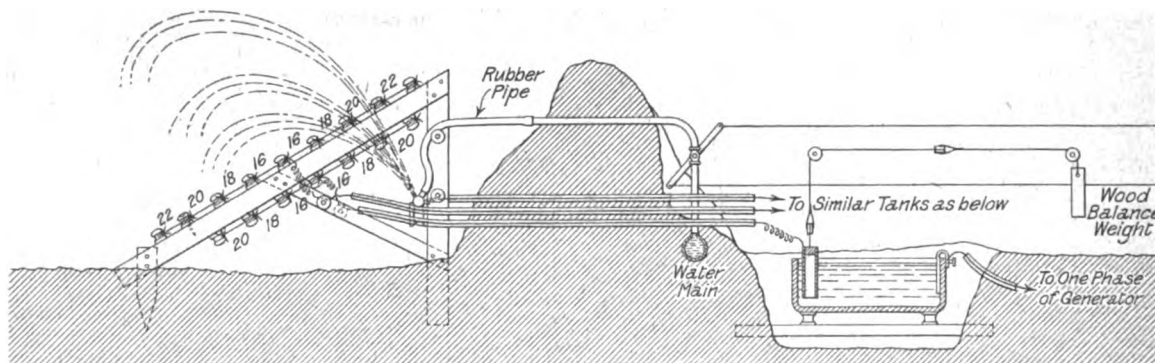
**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

#### QUESTION No. 1,411.

I should be glad to know the best way of arranging to measure the winding ratios of transformers by potentiometer.



An example would be a 500 k.v.a. three-phase delta-star 6,600/356-volt, 50-period transformer. I believe this method of testing is employed by some transformer manufacturing firms.—W. C. K.

(Replies must be received not later than first post Thursday, October 8th.)

#### ANSWERS TO No. 1,409.

It is desired to erect around a city two miles in diameter a system of barbed wire charged at 3,000 volts as a protection against assault. Two three-phase generators, each capable of supplying 5,000 kw. continuously at this pressure, are available. Suggest the best design for the network, and the method of connection and arrangements of cut-outs, taking all the circumstances into consideration, including the necessity of automatically cutting out a section of the wire temporarily, if earthed, to save burning out the generators, and so cutting off the pressure

from the whole network, and, if possible, the automatic replacement of cut wires.

M. YOUNG (to whom an award of 10s. is made) sends the following suggestions:—

As shown below, two banks of barbed wire are supported on wood frames and insulators. Each bank is live to one phase of the generator through a special water-resistance. The third phase is connected to a two-inch water-main which sprays hard water or brine. A short or earth on any section will not be dead, but through the water-resistance. The balanced tube electrode is closed at the top, and will drive itself clear of the water by means of steam generated in its interior. Thus it acts as a time lag switch as well as a resistance. This resistance can also be used as a remote control worked by means of the insulated suspension cord.

The several rows of barbed wire are made live from the centre wire. The size of connecting links are graduated from No. 16 copper at the centre to No. 22 at the outside. This might clear a short on the outer wires and still leave the centre alive. Besides damping the ground, the live water-spray would prevent approach to the wires. These defences could be erected in hundred yard lengths.

No second award is made.

**Corrosion of Condenser Tubes.**—An article by E. Bate in the *General Electric Review* deals at some length with causes leading to the pitting and corrosion of condenser tubes. These causes may be briefly stated thus, stray currents from grounded systems, galvanic currents between the dissimilar metals of which the condenser is constructed, galvanic currents due to deposits of active material inside the tubes, use of unsuitable mixture for the material of the tubes. The increasing use of negative boosters on grounded systems prevents the first-mentioned point from being of serious importance. Regarding the second point, the alloy of which the tubes are usually composed is electro-negative to the cast-iron casing, so that no corrosion of the tubes could be caused by these currents. That the third cause is responsible for the greater majority of tube failures is borne out by the fact that 96 per cent. of the tubes examined by the author were pitted in the lower half, where, of course, all internal deposits would collect. It is suggested that in cases where the circulating water is drawn through a long line of cast-iron piping, oxide of iron and carbon may be deposited in the condenser tubes, thus giving rise to injurious electrolytic action. The author is of opinion that, once local corrosion has commenced, it cannot practically be stopped. A suggested method of preventing this deleterious deposit in the condenser tubes is to treat the interior of the cast-iron piping so as to prevent corrosion, and to keep the intake pipes as short as possible.

**Electrical Employees and the Army.**—About 25 per cent. of the total staff of the County of London Electric Supply Co., repre-

senting 75 per cent. of those eligible, have left for war service. The Company have arranged to keep the whole of the men's places open for them, and to continue pay, and special arrangements have also been made to assist the wives and dependents of all members of the staff on service.

Up to the present 453 men, equivalent to 20 per cent. of the British Aluminium Co.'s employees, have joined the fighting forces including men from the Kinlochleven, Larne, Milton, and the head office. Their places are being kept open, temporary provision being made in the meantime by drawing men from industries which are slack. Financial provision is being made for the staff in accordance with their responsibilities, and the families of all married employees serving with the Colours, or others dependent upon them, are being paid 10s. weekly, those residing on the Company's premises are permitted to do so rent free for the present.

## PRECAUTIONS IN STARTING ROTARY CONVERTERS FROM TRANSFORMER TAPPINGS

By E. P. Hill

THE rotary-converter has become such a useful and necessary servant to the modern electrical world that little apology is required for bringing forward information useful to the large number of users of this class of machine. Neglect of one or other of the following precautions may be the cause of serious trouble. The method of starting by low voltage-taps from the transformer is applicable only to machines up to about 300 kw., the difficulty on larger sizes being the disturbance of supply from the large wattless current drawn during the initial starting period. There is, in addition, the trouble that the polarity to which rotary will build up is subject to no control whatever, and must be reversed should it build up incorrectly. This latter point is in practice not productive of much difficulty, as a field change-over switch can be used, and there is, in addition, always the possibility by opening the main switch momentarily of rapidly reversing the polarity by slipping a pole. The main poles of the converter are fitted with grids, which act as the squirrel-cage rotor of an induction motor, and, together with the iron loss in the pole shoes, produce sufficient torque to bring the armature up to approximate synchronous speed. When the field switch is closed, the machine builds up and pulls into step on the low-voltage side of the changeover switch, and on the switch being thrown over, full voltage is applied, the rush of current being controlled entirely by the amount of reactance in the transformer circuit.

Should the machine be fitted with commutating poles, it

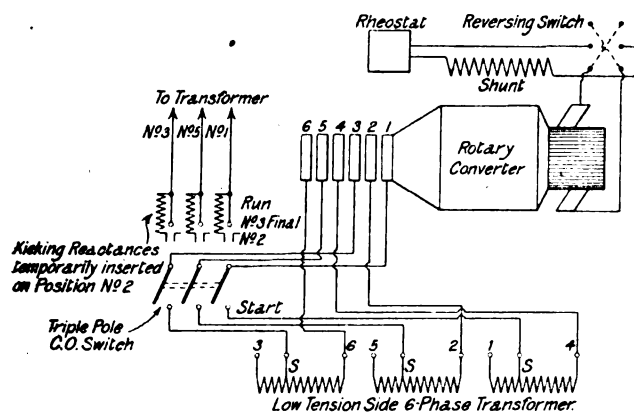


DIAGRAM OF CONNECTIONS FOR TAP STARTING OF 6-PHASE ROTARY CONVERTER.

is necessary to short-circuit them during starting to prevent the rotary "locking" at half-speed, that is, behaving as if it had twice its real number of main poles. If this precaution be neglected, a much slower start obtains, and sparking trouble occurs on the D.C. brushes. Again, the fact that the machine is only running at half speed may easily be overlooked, and, on switching over after the usual lapse of time, a flash-over occurs. It is advisable to wait on the starting side until the phase swinging dies down before changing over. Frequently surges in the supply (especially in traction circuits) cause a few seconds to elapse before a steady condition is reached, and after being instructed, an attendant, by the characteristic note, can tell when the time for switching over has arrived, and so avoid a flash on the commutator, and other ill effects. When the machine has to meet stringent guarantees of voltage regulation and efficiency the reactance necessary to limit current rushes has to be temporarily inserted during starting period by means of a kicking contact on change-over switch, as shown in the figure, attendants are tempted to throw over the switch on to the final position without pausing, as is intended, on the kicking contact. A stop is sometimes provided to ensure correct working, but some makers prefer to leave this to the discretion of the attendant in case he should, by the use of stop, burn out the grid resistances. A pause of from one to two seconds should be made on the kicking contact, when it will be found that a very satisfactory start results.

The brush friction loss of tap-started rotaries has considerable influence on the time taken to come up to speed. An unskilled attendant becomes very alarmed by the fact that the machine will not come up to speed, whereas a wipe of the commutator with a little lubricant will at once rectify matters. Too heavy brush tension or a rough commutator will cause

this trouble, but probably the transformer tap is too low when this symptom occurs.

In addition to the foregoing peculiar to rotaries of this kind, it is necessary, of course, to be alive to the usual maintenance precautions of ordinary D.C. and A.C. machinery of this description, in order to get the best out of what is without doubt an excellent piece of electrical plant.

## PROPOSED NEW BELFAST POWER STATION

### Three-phase High Tension Recommended

FOR the past two years it has been realised that something approaching a reorganisation of the Belfast electric supply undertaking was necessary in order to keep pace with the rapid growth in the demand. It cannot be complained that the Corporation has acted with precipitancy in the matter, for the question was under serious discussion during 1912 when a scheme for a new power station prepared by the City Electrical Engineer, Mr. T. W. Bloxam, was submitted to Mr. S. L. Pearce, Chief Electrical Engineer to the Manchester Corporation, who gave it his approval. Simultaneously a proposal was made by the Tramway Manager that Diesel engines should be installed in the existing power station for the purposes of the tramway undertaking, but this scheme did not meet with favour. Later on a deputation of ratepayers waited upon the Corporation and urged delay on the ground that Messrs. Harland and Woolf were developing a new type of Diesel engine, and that this might prove to be more economical than steam turbines. Our own inquiries at the time, however, showed that Messrs. Harland and Woolf were merely experimenting with the engine in question, and that its manufacture had not been entrusted to any of the three makers of Diesel engines well known in this country to our readers, but had been placed in the hands of a large firm of shipbuilders in Copenhagen with whom Messrs. Harland and Woolf have working arrangements. From early in 1913 and until a few months ago the proposal did not make any material progress, but in June Sir John Snell and Mr. W. J. Pratten (formerly Manager of the Engineering Department of Messrs. Harland and Woolf) were called in to report. These reports were referred to briefly on page 522 of our last issue, and we now review them in greater detail.

The two consulting engineers were asked to report as to the best means of extending the undertaking, having regard to the demand already made by large works and to the probable future demand from all sources, and both reports discuss the alternatives of extending the present power station, or building a new and supplementary station. Sir John Snell emphatically advises the Corporation on no account to remodel or to extend permanently the existing power-house at East Bridge Street, but to build a new station on a site already acquired from the Harbour Commissioners, and to adopt the three-phase high-pressure system. Sir John also advises the immediate purchase of a 8,000-kw. turbo-alternator, surface-condenser, and pumps, together with a second 1,000-kw. rotary-converter, one being now on order. The latter are to be installed at East Bridge Street, and if the turbo-alternator is ordered now, it could be erected in its permanent position on the new site by the autumn of next year. In Sir John's opinion any extension at East Bridge Street would only postpone the necessity for a second power-house at the least for two years.

Mr. Pratten's report deals more in detail with the possibility of extending East Bridge Street, but he points out that if the Council wish to pursue their policy of encouraging manufacturers to take current, and to supply at a very low rate per unit, there is no other course but to build a new three-phase power-house with 6,000-volt turbo-generators.

If, on the other hand, extensions are decided upon at East Bridge Street and the new power station not proceeded with, he recommends that some of the older Belliss engines should be replaced with turbo-alternators, and a new 1,000-kw. turbo-generator added. The substitution of six Lancashire boilers by four Babcock and Wilcox boilers also would enable an additional 2,000 kw. of generating machinery to be run. This alteration, however, would make the buildings very congested, and no further increase of plant could be carried out at East Bridge Street. Incidentally, the maintenance of the plant at East Bridge Street and the general management is spoken highly of in both reports.

Sir John Snell also deals briefly with the question of costs and charges. The average cost of power, assuming the load-factor of power consumers to vary between 20 per cent. and 25 per cent., is from 0.9846d. to 0.8615d. per unit., and the average receipt is 1.159d. per unit. Some of the large



power users with load-factors of, say, 30 per cent. would only cost 0.78d. per unit, and mills, which usually give a load-factor of 50 per cent., could be supplied, even under present conditions, at 0.6d., and when the three-phase high-tension scheme is ready could certainly be supplied with a margin of profit at even a less figure. Heating could be supplied without loss at an average of  $\frac{1}{2}$ d. even now. With the exception of the small item of public lighting Sir John thinks the whole system of charging has been established on a very sound and business-like footing.

The reports are at present under consideration by the Tramways and Electricity Committee.

### TRADING WITH THE ENEMY

IN connection with the Government Proclamation as to Trading with the Enemy, concerning which we made some comments on page 502 of our issue for September 17th, we have received a document from the British Engineers' Association setting forth the opinions of the Council of that body. These largely coincide with the original resolutions of the B.E.A.M.A., set out on page 514 of our last issue. The Council of the British Engineers' Association, which, by the way, represents British manufacturing engineers, with a combined capital of over £100,000,000, and was formed with the object of fostering British trade with China, has been moved to act in the matter by the receipt of more than 200 communications from its members and from engineering firms outside the Association asking for advice in the matter. Complaint is made that the general effect of the Proclamation not only permits alien enemies in this country to trade, thereby keeping their "goodwill" alive during the war, to the permanent detriment of the business of *bond fide* British firms, but opens a means of passing money from Great Britain to Germany and Austria at a time when that money will be used to prolong the war. Attention is also called to the fact that goods from existing stocks carried in Germany and Austria can actually be procured in Great Britain at the present day through a neutral country.

On account of, in the Council's opinion, the dangerous effect of this policy, a protest has been addressed to the Government urging the revision of the terms of the Proclamation, so that, at all events, certain Germans and Austrians in this country, and more particularly (a) those who manufacture in Great Britain and (b) those who act as agents for manufacturers in Germany and Austria, should be classed as "enemies." The Council hold the view that a Controller appointed by the High Court should be placed in charge of every manufacturing concern in this country which is owned or controlled by Germans or Austrians, so that no payments can be made by such concerns to individuals or firms in Germany or Austria. The Council also hold the view that all trading with German and Austrian agents in this country should be prohibited.

A definition of the class of individuals and firms located in this country who should be considered as enemies, and with whom it is undesirable to trade, has been laid before the Government on the lines suggested above, the status of such parties, it is suggested, being determined by their actual status on June 1st, 1914. The Council recommends members of the Association not to enter into any sort of trade transaction with individuals or firms who come within the definition outlined, and has collected and filed particulars relating to the constitution of a considerable number of firms in this country who have interests in Germany and Austria. This information, which will be added to, is open for investigation by members.

### THE INSTITUTION OF ELECTRICAL ENGINEERS AND THE WAR

THE Institution of Electrical Engineers has had a busy time in connection with the recruiting of the 500 men which the Institutions of Civil, Electrical, and Mechanical Engineers have been invited by the Lords Commissioners of the Admiralty to obtain for the Divisional Engineer Units and Signal Company of the recently formed Royal Naval Division. Particulars of the detachment were given on page 508 of our issue for September 17th. Practically all the work has fallen upon the Institution, whose whole staff has been more or less engaged upon it. Up to Tuesday some 450 recruits had been passed as medically fit by the doctors, and detachments have been sent off practically daily in three batches to the camp near Martin Mill Station, Kent. It was an advantage that two members of the Institution's bankers, Messrs. Cox, Biddulph & Co., were Justices of the

Peace, and these two gentlemen have attended at the Institution building twice daily for the swearing in of recruits. We believe that the three Institutions have contributed representatives in more or less equal proportions, and there is, of course, little doubt that the full 500 men will be obtained.

Another direction in which the Institution has been of service is in connection with supplying men to fill, temporarily, vacancies upon central station staffs whilst the regular employees are on service. As we mentioned on page 472 of our issue for August 27th, some 1,100 members responded to a circular letter sent out by the Institution, a number many times greater than the requirements so far; central station engineers have availed themselves to a certain extent of the offer of their services, with the result that several men ineligible for military service, and who were out of employment, have been found temporary positions.

### ELECTRIC TRACTION NOTES

Experiments have at last been carried out in Hove with trolley omnibuses. Hitherto all work in this direction under the combined scheme with Brighton, sanctioned by Parliament two years ago, has been carried out in Brighton. The omnibus used by the Hove Corporation is of the double-deck type, which has already been officially sanctioned by the Board of Trade in Brighton. The object of the test, it is stated, was to demonstrate the advantages of the over-running trolley as against the under-running trolley, which has been adopted in Brighton.

The Committee of the Bristol Corporation which has had the question of the purchase of the Tramways Co. under consideration, recommends the Corporation first to negotiate with the Company with regard to terms if the Corporation does not exercise its option to purchase for seven, fourteen, and twenty-one years.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

An article in a recent issue of the *Wireless World* describes the control of fog signals by wireless. The signals, which are placed at various points in the Firth of Clyde, and consist of Stevenson-Moyes gas "guns," in which a charge of acetylene and air is fired at intervals. The gas admission and ignition is quite automatic, and once the gas is turned on the cycle of operations proceeds regularly. All that is required, therefore, is to control the gas valve electrically, so that it can be turned on in time of fog. The needle valve used for the purpose is actuated by two electromagnets, one for opening and the other for closing. These are controlled by a relay working in conjunction with a special form of coherer, which receives the signals through a jigger transformer. The principal feature of the apparatus are the selective synchroniser, by which the apparatus only responds to a particular signal, different signals being employed for the turning on and turning off circuits. A 14-foot receiving aerial of the wires is used, and the transmitting apparatus is of the simplest character, embodying synchronisers of similar nature to the receiving synchronisers for giving the correct signals. One of these fog guns is at work on Rose-nath Patch, and is worked from Gourack. Another is at Fort Matilda, and two more are about to be installed.

A Reuter message from Washington states that permission has been granted for the wireless telegraph station at Sayville, Long Island, to operate commercially with Germany until January 1st, 1915. The station has been operating for some time, but had not been officially sanctioned.

The Direct Spanish Co.'s cable between Falmouth and Bilbao was down on the 23rd ult. and in working order again on the 28th ult.—Montenegro notifies that private telegrams in secret language are not admitted, and they are subject to censorship, delay, and senders' risk.—The cable between St. Jacques and Dason is down.—The Eastern Telegraph Co. and Associated Cos. state that as from October 1st deferred telegrams will be again accepted subject to the reservation that this service may be again suspended when their cables are blocked.

## "ELECTRICAL ENGINEERING" PATENT RECORD

\* (This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published September 24th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

22,149/13. **Commutator Connections.** H. MENSFORTH (British Westinghouse Co.). The use in continuous current turbo-generators, &c., of commutator connections consisting of several steel cables side by side. Two figures.

1,238/14. **Current Regulation.** G. P. FINCATO (Milan). This regulator is controlled by the expansion of a metal rod heated by the current. The heated rod acts on a bent lever, which, when a certain small displacement has been produced effects a sudden movement of a system of springs connected to the contact which it is desired to open or close. Two figures.

3,963/14. **Wireless Telegraphy.** J. A. FLEMING. A high-frequency oscillation generator, consisting of one or more arcs in shunt with a condenser and in series with an inductive resistance. The electrodes consist of carbon rods in a copper enclosing cylinder open at one end, and nearly closed at the other, and both held vertically in a vessel containing high flash point oil. One figure.

6,350/14. **Searchlights.** W. E. GRAY and W. BEST. Arc lamps for projectors with the feed mechanism worked by an electric motor coupled to its gearing through a centrifugal clutch so that it can start up unloaded. Two figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.H. Co. (G.E. Co., U.S.A.) [Distribution system] 22,420/13.

**Switchgear, Fuses and Fittings:** NICHOLLS [Illuminated signs] 1,561/14; HOLOPHONE, LTD. and MYGATT [Metal cover for prismatic reflectors] 4,677/14.

**Telephony and Telegraphy:** STELJES [Morse apparatus] 20,269/13; DE BERNOCHI [Wireless type printing telegraph] 3,371/13.

**Traction:** COLAS [Contacts for traction circuits] 26,268/13.

**Miscellaneous:** DARMOIS and LEBLANC [Vapour electric apparatus] 20,821/13; CAMPBELL [Electrically driven ash hoist] 20,853/13; WIDEGREN and WIDEGREN [Reduction of capacity of line in remote control system] 29,239/13.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Electrometallurgy:** MASCHINENFABRIK SÜRTH GES. [Electrolytic apparatus] 8,367/14.

**Telephony:** SEELAU and another [Receiver and transmitter with phonographic styles] 14,441/14.

**Incandescent Lamps:** LANGMUIR, 17,326/14.

### Applications for Suspension of Patents

12,871/13. **Electric Ignition.** W. RUTHARDT (Stuttgart). An application for suspension of this patent made by C. A. Vandervell and Co. will be heard on October 7th. The Patent is for timing devices in magneto ignition gear in which the part carrying the contact to be displaced angularly is moved positively in one direction but tends to return in the other direction by the action of a helical spring lying in an annular groove in the movable part.

20,922/12. **Magnetic Clutches.** VULCAN MASCHINENFABRIKS A.G. and 23,150/12, **Switches for Magnetic Clutches.** E. C. R. MARKS (Vulcan Maschinfabriks A.G.). Applications by Glenfield and Kennedy, Ltd., for the suspension of these patents will be heard on October 8th. The improvements in magnetic clutches in question involve a way of making the rim of the armature with a thinned edge to reduce inertia without reducing the area of the field required for the magnetic flux. The switches are of the reversing type suitable for planing machine control.

### Opposition to Grant of Patents

26,764/13. **Conduit Joint.** J. B. A. HEMMING. Opposition has been entered to a grant on this application, covering a continuity grip in which a set screw through a lug in the socket has a portion of its thread cut away in boring out the socket so that a quarter turn is sufficient to cause it to engage with the tube when inserted. This grip was described in ELECTRICAL ENGINEERING, June 18th, page 351.

### Amendments Made

10,373/13. **Electrical Drive of Jacquard Machine.** G. CORSI (Milan). This specification has been amended by several verbal alterations and the substitution of two new claims for the original four.

11,784/13. **Vacuum Cleaners.** M. S. WRIGHT. This specification has been amended by way of disclaimer.

### Expiring and Expired Patents

The following Patents expire during the current week, after a ~~life~~ of fourteen years:—

17,642/00. **Thermal Galvanometer.** W. B. DUDELL. An instrument for measuring small currents and potential differences consisting of a radio micrometer combined with a resistance heated by the current to be measured.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** GEB. SIEMENS & Co. [Searchlight carbons] 13,071/07; H. T. HARRISON and H. HIRST [Flame arc lamps] 13,190/07; GEB. SIEMENS & Co. [Searchlights with curved carbons] 1,316/09; W. R. RIDINGS [Magazine lamps] 13,842/09.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** H. EDMUNDS and P. DAWSON [Couplings for mains] 12,171/06; R. P. JACKSON [Voltage regulation] 12,493/06.

**Ignition:** H. BIRNBACH [Electric gas lighting] 13,417/06.

**Incandescent Lamps:** F. P. DRIVER [Attaching filaments to leading in wires] 13,354/07; O. KRAUSE [Filament supports] 22,458/09.

**Instruments and Meters:** R. KENNEDY [Meters] 9,254/08.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**PRINTING PRESS CONTROL.**—A leaflet from the Igranic Electric Co. (144 Queen Victoria Street, E.C.) puts forth the advantages of their well-thought-out systems of control of electrically-driven machinery, very opportunely at a time when many newspaper machines are working their hardest.

**METAL FILAMENT.**—A list of Auriga lamps from the British Westinghouse Electric & Manufacturing Co. (Trafford Park, Manchester) contains particulars of half-watt and ordinary standard as well as special metal filament lamps, and is accompanied by the welcome statement that they are British-made.

**SHAFT SIGNALLING FOR MINES.**—A pamphlet from the Sterling Telephone & Electric Co., Ltd. (210-211 Totten-

ham Court Road) describes the Sterling shaft-signalling system for mines, designed to comply with the Home Office requirements in providing an automatic visual indication of the nature of the signal until it is complied with. A luminous indicator is used in combination with an arrangement of bells, relays, and signalling keys.

Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."

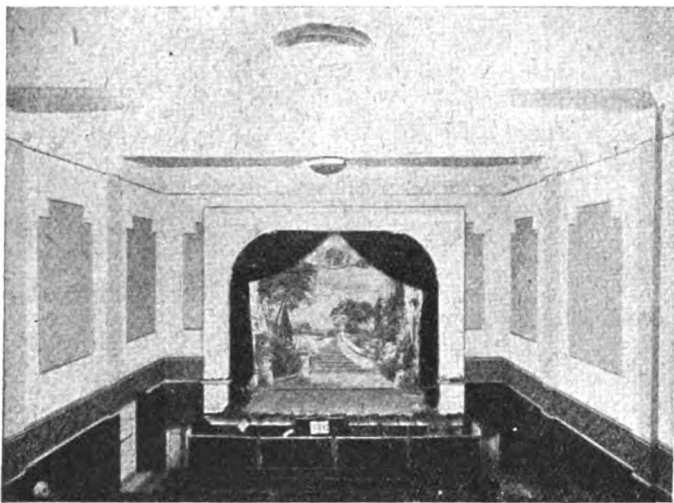
**CONTINUOUS CURRENT MOTORS.**—A new list of their latest designs of protected type continuous current motors up to 50 h.p. has been issued by Crompton & Co., Ltd. (Chelmsford). A large range of standard sizes are listed in a convenient way, so that the price of a motor for any output and speed can easily be picked out.

**ELECTRIC PUMPING PLANT.**—The British Electric Plant Co., Ltd. (Alloa), manufacture both centrifugal pumps and special high-speed motors for driving them, and have just issued an interesting pamphlet describing combined sets of this nature, including portable and other pumps of both the horizontal and vertical patterns, and special centrifugal boiler feed pumps.

### THE LIGHTING OF A PROVINCIAL CINEMA

WE have on various occasions illustrated examples of indirect lighting as carried out on the British Thomson-Houston Co.'s "Eye-Rest" system, in cinematograph theatres of the larger and more palatial type. We are now able to illustrate an example of an installation of this kind at a smaller provincial house.

The main portion of the auditorium at the Empire Cinema, Rugby, measures 84 ft. by 40 ft., and the ceiling is 28 ft. high. It is lighted by a single 24-in. "Eye-Rest" brass bowl fitting, containing ten 80-watt Mazda lamps in X-ray reflectors. Over the balcony, which is 84 ft. by 24 ft., there are two 18 in. "Eye-Rest" fittings, each containing three 60-watt Mazda lamps. The space underneath the balcony is lighted by two similarly equipped fittings. The total wattage in the auditorium is thus 1520 watts, which is not excessive, considering the area of the hall and the quality of the illumination. All the auditorium lights are controlled by a single-plate metallic dimmer installed in the operator's



THE EMPIRE CINEMA, RUGBY.

box. The vestibule is illuminated by a single 100-watt Mazda lamp in an intensive type Veluria glass reflector; and a 60-watt lamp similarly equipped is used in the manager's office. Mazda lamps and Mazdalux metal reflectors are used in the pay-box and power-room. The exterior lighting, which is an important feature from an advertising point of view, is carried out by three 600-watt Mazda lamps in intensive Veluria reflectors attached to wall brackets. The British Thomson-Houston Co. also supplied the motor-generator, which consists of a squirrel-cage induction motor, running off a three-phase alternating-current supply at 220 volts, 50 cycles, and driving the generator at 940 r.p.m. The generator is rated at 65 volts, 50 to 60 amps., and delivers current to the projector arc. We understand that the proprietors have expressed great satisfaction with the installation. The British Thomson-Houston Co. will be pleased to give full particulars of this and other cinema installations to readers who are interested, and who will write to or call on the Company's Illuminating Engineers' Department, Mazda House, 77 Upper Thames Street, London, E.C.

### ELECTRIC HEATERS

THERE is every prospect that the radiator side of electrical business during the coming winter months will see little falling off, owing to the fact that their economy after the initial outlay will be recognised, and the effects of the war upon buying luxuries will not come into this class of comfort. Also there are bound to be fresh markets opened, owing to the increase in convalescent homes, hospitals, &c., where electric radiators will be more largely used than previously. Fig. 1 shows one of the heater shops of the Edison & Swan United Electric Light Co., Ltd., at Ponders End. The operatives can be seen assembling parts for the "Royal"

An illustration is given in Fig. 2 of the "Royal" heater ("Quartzalite") which is of elegant design in brass of best

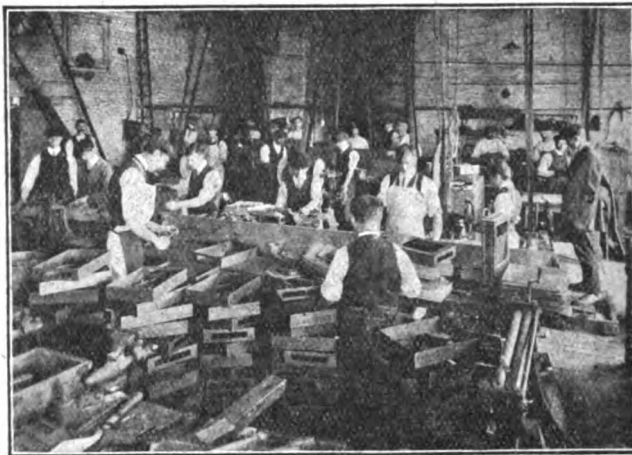


FIG. 1.—HEATER SHOP AT EDISWAN WORKS.

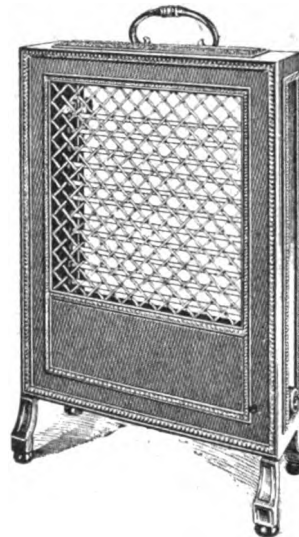


FIG. 2.—"ROYAL" QUARTZALITE HEATER.

material specially suitable for use in drawing-rooms, boudoirs, convalescent homes, hospitals, &c.

**British-made Osram Lamps.**—In last week's *ELECTRICAL ENGINEERING* (page 512) we published an illustrated description of the Osram lamp works at Hammersmith. A further opportunity of making ourselves familiar with the manifold processes which go to make the modern metal filament lamp and satisfying ourselves that they are all (with the possible exception of some of the lamp-caps obtained temporarily from Holland) carried on by British operatives on British soil under British management, was given on Wednesday of last week, when a large and representative body of pressmen were shown every department of the magnificently equipped works at Brook Green. The company already prepare tungsten metal from the ore, and draw the wire at Hammersmith; they have for many years made all their bulbs at Lemington on the Tyne, and it is an open secret that before long they will make their own lamp-caps. We saw "half-watts" being made, as well as ordinary and special Osram lamps. Lunch, at which many guests were entertained, was presided over by Mr. E. Byng, and among the few speeches that were made, the Mayor of Hammersmith, Mr. H. Forman, expressed his gratitude to the Osram and Robertson lamp works for the great benefits and prosperity they had brought to his Borough. Mr. Chris. Wilson, the deservedly popular manager, explained how the Osram works had grown up out of the original Robertson works established twenty-one years ago, and refuted all charges that the business was in any way German, otherwise than that they had picked the brains of Germans and Austrians, as well as of other nations, in developing some of their manufacturing methods. Other speakers showed their appreciation of the patriotism of the firm, and the company broke up well pleased with what they had seen and the lavish hospitality of their hosts. Before lunch an interesting demonstration of the safety of the employees was afforded by the ringing of the fire-bell, when the girls poured out of the huge premises in an incredibly short space of time, while the famous Osram fire brigade got their hoses playing on the building.

## CORRESPONDENCE

## THE B.E.A.M.A. AND THE WAR.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—We notice that in an article on the above subject appearing on p. 514 of your issue of September 24th, you say that the *Electrical Review* was asked by the B.E.A.M.A. not to publish its "State of War" resolutions, but had failed to comply with the request. In view of the fact that no such request was ever made to us by the Association named, or by any of its officials, we must ask you to correct this statement in your next issue.—Yours truly,

4 Ludgate Hill, E.C. H. ALABASTER, GATEHOUSE & Co.  
September 24th, 1914.

[We regret that we should have published the above incorrect statement through a misunderstanding. The B.E.A.M.A. were not desirous that the technical press should publish the resolutions, which had been circulated as a preliminary step to members only, and had not been confirmed; but apparently we were wrong in thinking that the *Electrical Review* had been definitely informed of this. We ourselves took the obviously correct course of asking the Association's permission before publishing the matter at that stage, and we were requested to delay publication. We naturally thought that a similar request had been made to the other technical papers, who, we had understood, had also been in communication with the Association.—Ed. E.E.]

## BELGIAN TRADE.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—Will you be so kind as to let your readers know, through the medium of your paper, that, owing to the cessation of the sale of German goods in Belgium, there will be a great demand for British, and we should be pleased to hear from firms supplying armature stamping, brush-holders, carbon brushes, dynamo wires, cables, &c., with a view to represent such firms here.

Thanking you in anticipation, We are,  
21 Rue du Brésil, Antwerp. Yours truly,  
September 21st, 1914. Bugg & Co.

## ARC LAMP CARBONS.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—With reference to the recent correspondence regarding the scarcity of arc-lamp carbons, we have pleasure in announcing that our works in Switzerland are working day and night, and we are fully capable of executing orders for any quantity of all kinds of arc-lamp carbons as heretofore. The difficulty in procuring raw material has now been overcome, and we are experiencing very little inconvenience as regards shipments.—Yours faithfully,

109-111 New Oxford Street, THE ELECTRICAL ENGINEERING  
London, W.C. & EQUIPMENT CO., LTD.  
Sept. 24, 1914. (CH. LEVEN, Managing Director.)

**Obituary.**—We regret to record the death recently at Rochester, New York State, of Mr. Robert Hope-Jones, M.I.E.E., whose name is so closely associated with the application of electricity to organs. One of the most important inventions in this connection was an organ-stop known as the diaphone. It may also be mentioned that Mr. Robert Hope-Jones was associated with telephony many years ago, and occupied the position of Chief Engineer of the Lancashire and Cheshire Telephone Co. before the National Telephone Co. took it over, and has several inventions to his credit relating to telephony. He was a brother of Mr. F. Hope-Jones of the Synchronome Co.

**The Prince of Wales's Fund.**—The sum of £460, contributed by the employees of Siemens Brothers & Co., at their Woolwich works, has been handed over to the Mayor of Woolwich for forwarding to the Prince of Wales's Fund.

**Foreign Patent Fees.**—The Board of Trade has issued a notice under the Royal Proclamation dealing with Trading with the Enemy, sanctioning the payment of renewal fees upon patents taken out by British subjects in an "enemy country," and also payment, on behalf of an "enemy," of the renewal fees on British patents.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Colwyn Bay.**—Turbo-alternators, water-tube boilers, E.H.T. and L.T. switchgear, cooling tower, crane, power station cables, rotaries and static transformers, substation switchgear, &c. Consulting Engineer, E. H. Lacey, 12 Victoria Street, S.W. October 20th.

**Eastleigh.**—Dr. J. A. Purves of Exeter is to report upon an electric lighting scheme.

**Fleetwood.**—The street electric lighting is to be improved.

**Stockport.**—The Guardians invite tenders from British manufacturers for electric lamps.

**Whitworth (Lancs.).**—Sub-station plant. Town Clerk.

## Wiring

**Dolgelly.**—The Board of Guardians is considering the adoption of electric lighting at the workhouse.

**Edinburgh.**—Electrical fittings for the Midlothian and Peebles District Asylum. Clerk, 19 Heriot Row. October 5th.

**Loughrea.**—Wiring and fitting of workhouse. Consulting Engineer, L. J. Lawless, 27 Castlewood Avenue, Rathmines, Dublin. October 8rd.

**Newmarket.**—Electric lighting of workhouse.

**Swansea.**—Wiring and fitting of new police station. Borough Electrical Engineer. October 5th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Blackburn.**—Fire station and firemen's dwellings (£81,600).—Electrification of Greenbank Bobbin Works.

**Chelmsford.**—School, Lady Lane.

**Clones.**—The Guardians have rescinded the resolution postponing the installation of electric light at the workhouse.

**Glasgow.**—Teachers' Training College at Jordanhill (£200,000).

**Folkestone.**—School, Park Road.

**Hull.**—Tuberculosis hospital (£14,498).

**Leicester.**—School.

**Mansfield.**—School.

**Nottingham.**—New school.

**Portrush.**—Public baths (£3,500).

**Port Talbot.**—New hospital. Architect, F. B. Smith.

**Sheffield.**—Children's hospital at the Eccleshall Workhouse (£5,842).

**Taunton.**—Small-pox hospital.

**Tynemouth.**—Elementary schools, Spring Gardens. Architect, A. K. Tasker, Education Offices, North Shields.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Belfast.**—The Corporation has decided to purchase an electric motor tower waggon from the Edison Accumulators, Ltd.

An important contract has been placed with the General Electric Co. for the electrical equipment of the York Street Flax Spinning Co.'s works. Individual drive is to be applied to the spinning frames.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, the following may be taken as the official quotation for electrolytic copper bars, viz., £57 to £57 10s. (Last week, £54 10s. to £55.)

**Canadian Agency.**—A Montreal company dealing in electrical supplies desired to be placed in communication with United Kingdom manufacturers of tungsten and carbon fila-



ment lamps, arc-lamp carbons, and street-lamp fittings. The name of the company may be obtained at 73 Basinghall Street, E.C.

**The Lighting Journal.**—We are asked to state that the offices of the Lighting Press Syndicate, Ltd., have been transferred to 37 and 38 Strand. Mr. A. J. Greenly has taken over the management of both the editorial and business departments.

**Change of Address.**—The advertising business conducted by Mr. Arthur J. Greenly has been transferred from 3 Victoria Street to 37 and 38 Strand.

## LOCAL NOTES

**Aberdeen: Increased Profit.**—The net profit on last year's working of the electricity undertaking was £4,960, an increase of £2,725 over the previous twelve months. This result has been obtained notwithstanding coal having cost 1s. 4d. per ton more than in the previous year; and is attributed entirely to the more efficient generating plant which has been installed at the Ferryhill power station. This includes a 8,000-kw. turbo-alternator installed in December, which has generated 5,081,400 units out of 6,861,860 units output since it was started up.

**Arbroath: Assessment of Electricity Works.**—The present assessment of the works of the Arbroath Electric Light & Power Co. is on the basis of £688 for works and generating station, and £532 for mains within the burgh. The Company last week appealed against this assessment and asked for it to be reduced to a total of £500, viz., £280 for works and £220 for mains. On the other hand, the Assessment Committee asked that the value should be increased to £1,470, viz., £827 for works and £643 for mains. It was agreed on both sides that the proper basis of fixing the valuation is revenue, but the question of difference was as to the application of this basis. The Assessment Committee took the revenue of the previous year, whereas the Company claimed that the average of the previous three years should be taken. The Court eventually fixed the total figure at £1,100, and the Company has decided to take the case further.

**Blackrock: Overhead Wires.**—The Council has applied to the Board of Trade for sanction to erect overhead wires in connection with its electric lighting Order, granted in the session just expired.

**Dewsbury: Corporation and Power Co.**—The Yorkshire Electric Power Co. has suggested that the Electricity Committee should consider the adoption of the general principle of co-operation with the Power Co. in relation to the question of the future supply of electricity in the Borough. The Committee has replied, however, that no circumstances have yet arisen which would justify it in following such a course.

**Glasgow: New Power Station.**—Considerable progress has been made with the preliminary building work of the new power station at Dalmarnock. The first section is estimated to cost £250,000.

**Portishead: Overhead Wires.**—The Clevedon, Portishead & District Electric Supply Co. has applied to the Board of Trade for sanction to erect a number of overhead wires for a supply to the South Liberty Colliery at a pressure of 550 volts.

**St. Anne's-on-Sea: Domestic Power Demand.**—The quantity of electricity used per month for domestic power purposes, such as heating, cooking, &c., has doubled itself during the past twelve months. The price of current for these purposes has now been fixed at 1d. per unit.

**Shoreditch: Electricity Accounts.**—There was a net profit on the electricity undertaking last year of £4,769, including £54 brought forward. Of this £1,500 is to be transferred to the relief of rates, and £2,500 to reserve fund. After meeting expenditure on account of change of pressure and the conversion of gas lamps, a balance of £120 is carried forward.

**Skipton: Electric Supply.**—A committee is to be formed to discuss with the Yorkshire Electric Power Co. the question of an electric supply in this district. The Council was one of few authorities which did not object to the Yorkshire Co.'s Bill as presented to Parliament last session. This, however, was drastically redrafted before it finally left Parliament. It would have given the Company powers to supply in Skipton,

but owing to the alterations it will now be necessary to deal with each district separately.

**Southend: Loans Cancelled.**—The Council has asked the L.G.B. to cancel recent applications for sanction to borrow £1,715 and £2,895 for the purposes of the electricity undertaking, as the Accountant has reported that these sums will not now be required.

**Stoke-on-Trent: Loss on Electricity Undertaking.**—There was a loss of £8,162 upon the working of the electricity undertaking last year, but this was foreseen when the estimates for the new power station, which has only been in operation for a short time, were prepared. Included in the deficit is a sum of £1,586 for meters. The number of units sold during the year was seven millions, compared with six millions in the previous twelve months, whilst, of course, the working expenses are debited with a considerable extra expenditure in respect of coal which cost on an average 11s. 10½d. per ton, against 8s. 10d. two years ago. Now that the central power station is in working order, considerable economies will be effected at the various smaller power stations hitherto used.

**Walsall: Loan Postponed.**—Application was to have been made for a further loan of £28,595 for expenditure upon the electricity undertaking. When the matter came before the Council at the last meeting, however, the Chairman of the Electricity Committee said that, having regard to all the circumstances, the Committee had decided to withdraw the application for the present in the hope that money might be obtained on more advantageous terms in the future.

**Warrington: Electricity Accounts.**—There was a net profit of £2,935 upon the past year's working of the electricity undertaking. The output shows satisfactory increase, that for power being no less than 985,488 units in excess of the previous twelve months. The Sales Department has also shown considerable activity during the year, the turn-over being £1,377 and the profit £282. The coal costs show an improvement of 6 per cent. over the previous year's figures, notwithstanding an increase of 4½ per cent. in the price of coal.

**York: Overhead Wires.**—The Corporation has given notice of its intention to apply for sanction to use overhead wires for electric supply purposes in several districts in the rural area.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Nairobi Electric Power & Lighting Co.**—A 6 per cent. dividend is declared on the ordinary shares for the June half year.

**Clyde Valley Electrical Power Co.**—The June half year's accounts show a net profit of £19,297 after meeting preference dividend and transferring £12,500 to contingency fund for depreciation. It is recommended that £1,925 be transferred to special reserve and the balance of £17,372 carried forward.

**Oxford Electric Co.**—An interim dividend at the rate of 5 per cent. per annum is recommended on the ordinary shares for the June half year.

**British Electric Transformer Co.**—An interim dividend at the rate of 6 per cent. is recommended on the ordinary shares for the June half year.

**South London Electric Supply Corporation.**—The 6 per cent. cumulative preference dividend for the half-year to September 30th will be paid on October 1st.

**Bromley (Kent) Electric Light & Power Co.**—An interim dividend at the rate of 4 per cent. per annum, less tax, is declared on the ordinary shares for the past half-year.

**British Insulated & Helsby Cables.**—An interim dividend at the rate of 8 per cent. per annum, less tax, is declared on the ordinary shares for the past half-year.

**British Aluminium Co.**—The half-yearly interim dividend is to be paid on the 6 per cent. preference shares.

**County of Durham Electrical Power Distribution Co.**—The directors announce that they have decided not to declare an interim dividend on the preference shares.

**Electro-Harmonic Society.**—The first smoking concert of the season will be held at Holborn Restaurant (King's Hall) on Friday, October 9th, at 8 p.m. Mr. A. H. Seabrook will take the chair.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 406 [VOL. X., No. 41]

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THURSDAY, OCTOBER 8, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLOQUE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, *Tuesday first post.*

Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

Corrections in Standing Advertisements, *Monday first post.*

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE position with regard to the L.B. & S.C. Rly. contract with a German firm for the electrical equipment of new trains is reviewed. (Page 534.)

AN article on Germany's telegraphic isolation explains how completely she is cut off telegraphically from the rest of the world, and of what little advantage to her are her wireless stations. (Page 534.)

THE use of star connected transformers on unbalanced three-phase circuits is discussed in our "Questions and Answers" columns. (Page 535.)

AMONG the subjects of specifications published last week at the Patent Office are mercury vapour apparatus, power-factor regulators, and distance control. A combined glass and metal Holophane shade has also been patented. One of the patents for the construction of the Berry transformer expires this week, after a full life of fourteen years. (Page 536.)

THE St. Pancras Borough Council has objected to a proposal by the L.C.C. that the period of repayment of certain outstanding loans on the electricity undertaking should be reduced by half. (Page 537.)

IN our notes on telegraphy, &c., we report a case of an illicit wireless station and review the possibilities with regard to such an installation.—Several new telegraph cables have been laid across the English Channel. (Page 537.)

AN article on "Trading with the Enemy" deals with a point in connection with the recent proclamation

which seems to have been misunderstood in some quarters, and also mentions arrangements which we have made to facilitate inquiries as to the position of firms so far as foreign capital and control is concerned. (Page 538.)

OTHER articles in our Trade Section deal with new conduit inspection boxes, British-made lamps, and an instrument works near Manchester. (Page 538.)

CABLE is required at Tunbridge Wells and St. Pancras; boilers at Maidstone; sub-station switchgear at Warrington.—Tramway extensions are to be carried out at Leeds and in London. (Page 539.)

THE lighting load at Marylebone remains practically stationary, but the cooking and heating demand shows great development.—The Belfast City Electrical Engineer has been instructed to prepare a scheme on the lines laid down by Sir John Snell.—The transfer of the control of the tramway power supply at Sheffield to the Electric Supply Department has been effected. (Page 540.)

## ELECTRICAL ENGINEERS AND THE ARMY

THE London Electrical Engineers (Territorials) have now received permission to recruit. A further opportunity, therefore, occurs for members of the electrical profession to join a corps where their technical abilities will prove a valuable asset to their country. Application should be made personally or by letter to the Commanding Officer (46 Regency Street, Westminster, S.W.).

The following have received temporary Commissions as Lieutenants in the Royal Marines for duty with the Engineer Units of the Royal Naval Division:—R. G. Aston, L. H. Rugg, G. H. Spittle, A. J. D. Chivers, H. Dobell, R. Grierson, A. Williamson, T. C. Aveling, R. Stoltenhoff, G. W. Revell, G. E. Morgans. It will be remembered that these Units consist very largely of members of the Institutions of Civil, Electrical, and Mechanical Engineers.

**L. & S.W. Railway Electrification.**—The Directors of the London & South-Western Railway Co. have decided to issue new 5 per cent. preference bonds to the value of £1,000,000, terminable at the end of ten years, for the purpose of defraying the cost of the electrification scheme. The issue will be offered at 99½ per cent.

**Arrangements for the Week.**—(To-day) Thursday, October 8th. Greenock Electrical Society. Visit to Hunter Place Sub-station, 7.45 p.m.—Friday, October 9th. Electro-Harmonic Society. Smoking Concert, Holborn Restaurant, 8 p.m.—Monday, October 12th. Institution of Mechanical Engineers Graduates. "The Reclamation of Waste Products in Industrial Undertakings," by G. H. Ayres, 8 p.m.—Wednesday, October 14th. Association of Engineers-in-Charge, St. Bride's Institute, Fleet Street, E.C. "The British Empire and our Work in it," by Frank Bailey, 8 p.m.—Thursday, October 15th. Greenock Electrical Society 21 West Stewart Street. "Alternating Current," by J. H. Parker.

## ELECTRIFICATION OF L.B. & S.C. RAILWAY

### What is to be done about the German Contract?

IT will be remembered that a very large extension of the electrical equipment of the London Brighton & South Coast Railway is in progress. The present electrically-equipped lines are running so successfully that last year it was decided that all the suburban lines should be run electrically, involving the alteration of about 120 miles of line, the conversion of which it was estimated would take four years. The section of these from Balham through Streatham Common, Norbury, Thornton Heath, Selhurst, West Croydon, to Wallington, was taken in hand first, and it had been anticipated that this would be completed by the end of the present year. Passengers passing along this line will notice that the laying of cables and the building of sub-stations is proceeding, but apparently the rate of progress has been considerably reduced, possibly owing to the difficulty of obtaining the necessary skilled labour since the outbreak of the war; a large number of men employed on this class of work have always been Reserve men, and no doubt many others have volunteered for the Army. The cable, or, at any rate, a great part of it, is, we believe, of Belgian manufacture, but probably it had been possible to get this delivered before the declaration of war, as it was already in hand at the works of Ateliers de Construction de Charleroi at the time of the autumn meeting of the Iron and Steel Institute in Belgium last year. The cable is of a special design; although made in Belgium, it was made on British cable-making machinery, and the split-conductor system of mains protection is employed.

It is not, however, the cable work that is giving rise to a considerable amount of conjecture in electrical circles, but the equipment of the rolling stock. The order for this was given to the Metropolitan Carriage, Wagon & Finance Co., Ltd., and the equipment, i.e., the motors, controllers, &c., was sub-let to the Allgemeine Elektrizitäts Gesellschaft of Berlin. Nothing has been heard yet of arrangements having been made to transfer this important sub-contract to a British firm; and although it is apparent that the completion of the electrical equipment of the first section will take far longer than originally expected, yet we trust that the matter will not be allowed to drift until it is too late to take the contract out of German hands. In railway circles it is well known that the Metropolitan Carriage, Wagon & Finance Co. are extremely busy at present with ambulance trains and other material required by the railway companies, and possibly also by the War Office, so that it is reasonable to suppose that the construction of the trucks and bodies for the electric trains will have been put on one side for the present. In two or three months' time, however, there is little doubt that things will be more normal in railway carriage works, and one cannot but think that the Metropolitan Carriage Co. will then adopt the course of obtaining the sanction of the directors of the L.B. & S.C. Railway to order the electrical equipment elsewhere. Although these equipments are of a special character, yet we can state with assurance that there are British manufacturers (and also American and Swiss firms) who could fulfil the requirements absolutely, and supply material quite as good as the Allgemeine Elektrizitäts Gesellschaft of Berlin. The trains on the electrical section of the line now running were equipped by this Company to the fairly detailed specifications of the consulting electrical engineer to the Company; they have, it is true, worked very satisfactorily, but the leading British firms of electrical manufacturers could certainly construct equally efficient apparatus to the engineer's specifications.

Another reason for delay is that the permanent-way work, the alteration of bridges, &c., has proved to be

very considerable, and it seems quite probable that the date of the opening of the Balham to West Croydon and Wallington section will be towards the end of 1915 instead of this year. Notwithstanding this, however, we once more repeat our fervent hope that early steps will be taken to award the sub-contract for the electrical equipment of the trains to a British firm.

## GERMANY'S TELEGRAPHIC ISOLATION

ALTHOUGH it is known from the German Chancellor's messages to neutral countries how bitterly Germany resents our action in cutting her "cable," the public here do not quite realise the extent to which Germany is isolated telegraphically from nearly the whole world. It is not one cable that has been cut or interrupted, but eleven.

Germany has five submarine cables which land at Borkum; one goes to Brest, one to Vigo, one to Teneriffe, and two *via* the Azores to New York. All these have been cut since the war began. They all five pass through the English Channel, so that there has been no difficulty in cutting them, and it is impossible for Germany to restore them. Between Germany and England there are six cables, part owned by the German Government and part by the British Government; traffic on all these has, of course, been interrupted by us.

So much for possible outlets on the west coast of Germany. No outlets by the North Sea through other countries are possible. Through Holland, Denmark, Norway, and Sweden communication westward can only take place through cables landing in England and France, so that every message can be censored. To the south, Germany can reach the coast of Austria and Italy, but there again communication of German messages would be stopped, for the cables running from west to east in the Mediterranean are owned by an English company, the Eastern Telegraph Company, and land on British soil. The cables from Italy (and also Turkey) proceed *via* Malta, Gibraltar, and Lisbon, to the Atlantic, and the cable from Trieste through the Adriatic Sea, which is also owned by the Eastern Telegraph Company, touches first at Zante (Greece) and then at Malta. No communication to Africa is possible without using a cable belonging to the Eastern Telegraph Company, and Germany is also cut off from communicating with China by land-lines, as these pass through Russia or India. Except through her wireless service, therefore, Germany can only telegraph to her dupe and ally Austria, and to the neutral European countries. It is perhaps just possible that occasional messages may be got through the Atlantic cables with the help of third parties in neutral countries; but no code messages are accepted, and all messages suspected as coming from Germany would naturally be stopped. Her only chance in this direction would be the use of some sort of "plain language code."

The wireless telegraphic service, as we know, continues, but every electrical engineer realises that it continues only because it is to our interest to allow it to do so. The procedure known as "jamming" in technical slang could be resorted to without difficulty; a series of impulses of the same wave-length as that of the German stations, emitted by any of our own high-power wireless installations as soon as the German signals commence would effectively drown the latter, and German news, whether true or false, would then no longer be received at Tuckerton or Sayville in America. Those in authority evidently consider that this stoppage of the German wireless would not be worth while as the wireless stations in Germany's over-sea dependencies have now, we believe, all been destroyed. The one at Kamina (Togoland) was the first to go, and by now the Bethany station in German South-West Africa has probably shared the same fate.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,412.

A consumer, without notifying the supply authority, increases his load so that for one or two hours every day the load exceeds by 50 per cent. the rating of his meter. What will be the effect of such a procedure on the chief patterns of meter on the market, and what indication will the supply authority have that this has been done? It is of course assumed that the main fuses have not blown.

(Replies must be received not later than first post Thursday, October 15th.)

### ANSWERS TO No. 1,410.

Please explain fully why, with three single-phase transformers connected "star-star," it is impracticable to take any load between phases and neutral on the secondary side. What effect has the earthing of the neutral point of the primary windings on this?—"POWER."

The first award (10s.) is given to "J. E. R. R." for the following reply:—

The reason it is not practicable to take load from between one line and the neutral point of three single-phase transformers coupled in star is that the neutral point of the H.T. winding gets shifted, thereby causing abnormal voltages to be impressed on two of the H.T. windings. This can be seen clearly when the accompanying figure 1 is studied. Here are shown three single-phase transformers coupled in star. Suppose a load to be taken from the L.T. line A, and the neutral point N, then the current of this load will cause a load current to traverse the H.T. winding A.N. of nearly the same ampere turns as the secondary current. This primary current will have to be

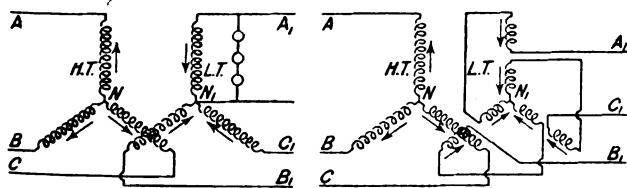


Fig. 1.

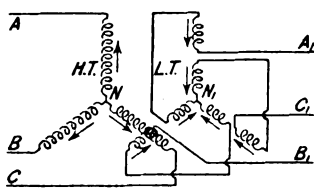


Fig. 2.

partly supplied through BN and partly through CN. Now as there are no corresponding amperes in the L.T. windings of BN and CN, they act as choking coils for the current supplied to AN, and consequently the voltage across their terminals may rise to an abnormal value, whilst that across AN will fall. The neutral point will therefore be completely shifted, upsetting the symmetry of the whole system.

Take the case when a similar load is drawn from one line and the neutral point of a three-phase transformer. Here all three magnetic circuits are interlinked by the cross core pieces, and all the flux going up one limb must pass via the butt pieces and down either of the other two limbs, so that the sum of the fluxes is zero. Consequently when the magnetic condition of one limb is altered there must be a corresponding alteration in that of the other two limbs, so that the neutral

point is approximately fixed. Taking load from one line and the neutral point in such a transformer does not lead to anything like the disturbance as in the case of three single-phase transformers. Slightly different voltages may be encountered, but providing the iron in the three limbs is of fairly equal permeability, the differences are not great. There is, however, a leakage field set up in the spaces between the coils of the loaded and unloaded windings which makes the regulation poor.

The remedy suggested, to earth the primary neutral point, which of course assumes the generator neutral to be earthed, may help to a certain extent, but it has one objection. The generator will keep up the voltage on all three phases of the primary, and thus fix the neutral point, but in all probability there will be a third harmonic present in the system which will cause heavy triple frequency currents to pass through the earth between the two neutrals. These may have very harmful effects on neighbouring telephone systems.

A better remedy is one adopted by the Westinghouse Co., which is to split up each of the three L.T. windings into halves and interconnect them as shown in Fig. 2. It will be seen that the demagnetising E.M.F.'s in the two halves of each winding are opposed, and thus when the load current is drawn as suggested two of the H.T. windings are affected equally, which makes the neutral point quite stable. A load may then be taken from any low tension line, and the neutral point, whether the primary neutral is earthed or not.

This method of interconnecting the L.T. windings also gives good results when applied to the windings of a shell type three-phase transformer.

The second award (5s.) is given to "ELECTRON," who writes as follows:—

Especially in colliery work it is often desired to take a lighting supply from one phase of a three-phase system, but this is impracticable when the pressure is stepped down by means of a star-star connected transformed with unearthed neutral points, for the following reason:—The load of lamps or of motors draws current from phase OC of the secondary only,

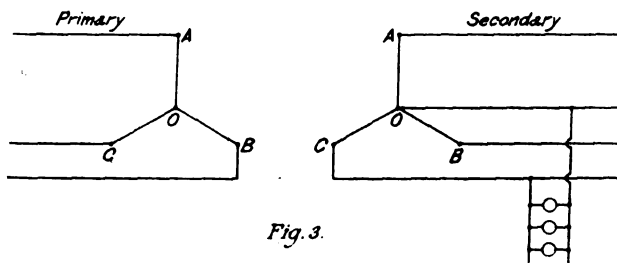


Fig. 3.

and in no way affects phases AO and BO (Fig. 3). But on the primary side the current in phase OC must return to the power-house, and, as there is no neutral connection, has necessarily to traverse either or both of phases AO and BO on the primary. This current passing through the two other phases naturally magnetises them, and the result is to influence the corresponding phases on the secondary. As no current is drawn from the secondary side of these two phases, the whole of the current flowing in the primaries must be a magnetising current, and the result is, therefore, a tendency for the secondary voltage on these two phases to rise. The actual neutral point, therefore, moves along from O towards C, and the voltage of phase OC drops away rapidly. Summing up, the effect of a load on one phase of a star-star connected transformer with a four-wire secondary is to short-circuit that phase and reduce its voltage practically to zero.

Earthing the star point on the primary side has no effect whatever upon the situation unless the star point of the secondary is also earthed. With this done, the trouble is entirely eliminated, but only at the expense of introducing further difficulties. As is generally the case, the star point of the generator will be earthed, and, as is well known, it is not permissible in a majority of cases also to earth the star point of the primary side of a transformer connected to such a generator. The third harmonic present in a voltage wave of the primary current of every transformer will raise the neutral point of the transformer to a potential above ground, depending upon the strength of the harmonic. A circulating current will then, as is well known, flow along the circuit composed of the transformer earth connection, earth, earth connection of the generator and along the line wires back to the transformer. These third harmonic currents may be of considerable dimensions, and for this reason it is undesirable to earth the primary neutral point of the transformer.

**Live Wire Defences.**—The use of live high potential wires with success for repulsing attack is again reported in Belgium on the river Nethe, between Duffel and Lierre, about eight miles south of Antwerp, where a force of Germans are stated to have been held up by "electrified wire entanglements," and "absolutely shattered."



## "ELECTRICAL ENGINEERING" PATENT RECORD

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### Specifications Published October 1st, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications. Names in italics indicate communicators of inventions from abroad.

20,821/13. **Mercury Vapour Apparatus.** E. E. DARMOIS and M. A. E. LEBLANC (Paris). An electrical heater is provided to facilitate starting, and a thermal contact prevents the main E.M.F. from being connected to the electrodes when the temperature is unsuitable. Five figures.

22,420/13. **Power Factor Regulation.** B. T.-H. Co. (*G. E. Co., U.S.A.*). Improvements in automatic regulators for the excitation of synchronous machines employed for power factor improvement. The regulator employed contains a floating contact, the position of which is varied according to the power factor. The contact is controlled by opposing potential windings, each connected across a side of the system, and a current winding associated with each potential winding connected in series with a phase of the system. One figure.

29,239/13. **Distant Control.** E. H. and K. A. WIDEGREN (Sweden). An arrangement for reducing the effect of line capacity in actuating electrical apparatus at a distance by means of pulsations from a continuous current source with a commutator rotating constantly or step by step with sliding brushes and connected with the continuous-current source in such a way that the bars are connected two and two alternately with the positive and negative side, and arranged so that the preceding bar of each pair transmits a current with lower potential than does the following one. Four figures.

4,677/14. **Shades.** HOLOPHANE, LTD. and O. A. MYGATT. Composite reflectors, consisting of prismatic glass reflectors with smooth metal covers spun over them. Four figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Batteries:** PRESTON [Primary batteries] 19,854/13.

**Ignition:** HORSTMANN [Automatically adjustable ignition] 21,607/13.

**Switchgear, Fittings, &c.**—BACON & REDPATH [Controllers for gun-training motors] 20,719/13; DOBSON [Lamp holders] 20,725/13; LEONARDT [Plugs and sockets] 22,926/13; MCCLELLAND [Shade-holder] 26,657/13.

**Traction:** BLACKBURN [Automatic locking devices for carriage doors] 21,516/13; BOWKER & JONES [Simultaneous carriage door locking] 21,895/13; DAMMOND [Track circuits] 9,611/14; ESTLER [Conductor rail insulators] 11,343/14.

**Miscellaneous:** AIKMAN [Electric torch] 20,990/13; GRATZE [Electric horns] 28,059/13; BIGGE and BUTT [Mercury breaks] 441/14; PARKS [Water level indicator] 17,835/14.

### THE REDUCED LIGHTING OF LONDON

THE following are the latest regulations issued regarding the reductions in lighting which are being made in London in connection with the Aerial Defence scheme:—

In all brightly lighted streets and squares and on bridges a portion of the lights must be extinguished so as to break up all conspicuous groups or rows of lights; and the lights which are not so extinguished must be lowered or made invisible from above by shading them or by painting over the tops and upper portions of the globes; provided that while thick fog prevails the normal lighting of the streets may be resumed. Sky signs, illuminated facias, illuminated lettering, and powerful lights of all descriptions used for outside advertising or for the illumination of shop fronts, must be extinguished. The intensity of the inside lighting of shop fronts must be reduced. In tall buildings which are illuminated at night the greater part of the windows must be shrouded, but lights of moderate brightness may be left uncovered at irregular intervals. All large lighted roof areas must be covered over or the lighting intensity reduced to a minimum. Lights along the water front must be masked to prevent as far as practicable the reflection of the light upon the water. The aggregation of flares in street markets or elsewhere is prohibited. In case of a sudden emergency all instructions given by the Admiralty or by the Commissioner of Police on the advice of the Admiralty, as to the further reduction or extinction of lights, shall be immediately obeyed.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Miscellaneous:** VON TAGUEEFF [Ozonisers] 27,258/13; GRUNER [Ozonisers] 18,025/14; LINDSAY [Electric primers] 18,810/14; HAMMOND [Teledynamic control] 19,013/14; A. E. G. [Internal combustion engine with electrically driven charging pump] 19,492/14.

### Amendment Allowed

9,945 and 27,340/13. **Illuminated Signs.** C. L. GRUGEON. Leave has been granted to amend those specifications by the addition of the name of M. E. Grugeon.

### Opposition to Grant of Patents

Opposition has been entered to the grant of a Patent in the following specification:—

8,975/14. **Signalling in Mines.** J. J. ADLINGTON. A system in which the signal is automatically recorded on a paper drum and also remains visually indicated on a dial, actuated by an electromagnet step by step arrangement, until the next signal is made.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

18,284/00. **Transformers.** A. F. BERRY and BRITISH ELECTRIC TRANSFORMER Co. This is for improvements in construction of the Berry transformer, especially in connection with the use of cores composed of several sector-shaped assemblages of sheets of different widths.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** T. SHEPHERD [Spring cable couplings] 13,358/03; N. LEBEDENKO [Cable sockets] 30,491/09.

**Dynamos, Motors and Transformers:** H. A. MAVOR and MAVOR & COULSON ["Spinner" motor] 13,724/07.

**Electrochemistry and Electrometallurgy:** S. Z. DE FERRANTI [Furnaces for nitrogen fixation] 13,965/06.

**Incandescent Lamps:** P. M. JUSTICE (*Deutsche Gasglühlicht A.G.*) [Straightening filaments by loaded hook] 13,956/06:—This is not the famous "weighting" patent 8,563/07.

**Telephony and Telegraphy:** J. A. FLEMING [Wavemeters] 13,736/04.

**Traction:** A. J. and A. C. BOUNEVILLE [Cab signalling] 13,932/02; W. FAIRWEATHER (*Brown Hoisting Machinery Co., U.S.A.*) [Overhead mono-rail locomotives] 13,427 & 8/04; A. H. BRYNOR and R. P. BROUSSON [Signals] 13,709/04; M. RATHBONE, H. FIELDING and A. P. LATHAM [Automatic points] 13,760/07.

**Miscellaneous:** F. W. HOWORTH (*Magneta Fabrik Elektrischer Uhren, Zurich*) [Electric clocks] 13,686/04; G. H. and H. H. HOOPER [Electric clocks] 12,987/08; W. E. LAKE (*Fabrik Elektrische Zünder Ges.*) [Shot-firing magnetos] 14,126/09.

**Overhead Wiring Fatality.**—We have our attention called to a cutting from a Canadian paper, which illustrates some of the dangers of the great complexity of overhead wiring in some American and Canadian cities. After an inquest into the death of a storekeeper, the jury returned a verdict that the deceased "Came to his death by electrocution caused by the Cataract Co.'s arc service wires coming in contact with the G.N.W. telegraph wires and then in contact with the Cataract Co.'s service wires and the said telegraph wires, thereby conveying extra high voltage into the house services, caused by the leaning of the cataract power pole and the general carelessness of the Cataract Power Co. . . . we . . . strongly condemn the general condition of the street wires in the city."

**University Announcements.**—The Goldsmid Entrance Scholarship, University College, University of London, tenable in the Faculty of Engineering, of the value of £90, has been awarded to Mr. John Sinclair Fraser, of Dulwich College. Mr. Patrick Alexander Curlett was placed *proxime accessit*.

The Calendar of Armstrong College, Newcastle-upon-Tyne, for the session 1914-15, contains full information as to the college, which is part of the University of Durham, and the courses carried on in its various departments. The Electrical Engineering section is under Prof. W. M. Thornton, and Mr. W. W. Frith also lectures on this subject. Students can qualify for the B.Sc. degree in Electrical Engineering by taking the full three years' course. Evening and Saturday classes are also held, and there are special courses in mining subjects.

## L.C.C. AND LOAN PERIODS

## Dispute with St. Pancras Borough Council

SOME interesting correspondence has taken place between the St. Pancras Borough Council and the London County Council with regard to the reduction of the period of repayment of early loans for the electricity undertaking. In the early days of electric supply in London an all-round period of forty-two years was allowed in respect of loans for the various undertakings belonging to the Borough Councils, but since then considerable modifications have been made in the periods. The following table is interesting as showing the variation in the periods up to the year ended July 30th, 1912:—

Purpose.	Periods in force to Nov. 27th, 1906.	Revised	
		Periods from Nov. 27th, 1906, to July 30th, 1912.	Periods from July 30th, 1912.
	Years.	Years.	Years.
Land ... ..	60	60	60
Buildings ... ..	42	50	30
Mains ... ..	42	30	25
Plant and Machinery	42	20	15
House Services ...	42	12	12
Meters ... ..	10	10	10

The dispute between the two authorities has arisen in connection with recent applications for sanction to loans of £15,000 for the Ljungstrom turbine, and £26,788, the estimated cost of extensions at the King's Road Station. The L.C.C. asked the Borough Council to reduce the period for the existing loans before the loans for the new plant were sanctioned. The period for repayment of existing plant is in most cases forty-two years, and the suggestion is made by the County Council that the outstanding period should be reduced by half, or to fifteen years from the present time, whichever is the shorter period.

In a report upon this matter the Borough Treasurer and Accountant points out that the amount outstanding on the old plant will be £108,481 on March 31st, 1915. The annual charge on the present basis for principle and interest is £6,328, whereas on the new basis of half the unexpired period this would be increased to £10,443, thus showing an increased charge to revenue of £4,115. The point of the County Council is that the new plant for which loans are now being asked will supersede much of the existing plant, but that point of view is not taken by the Borough Council on the ground that the bulk of the existing plant will have to be maintained in an efficient condition as a standby. It is further pointed out that some of the loans have been obtained from other sources than the County Council, and that there would be difficulty in rearranging the terms.

Mr. Sydney Baynes, the Borough Electrical Engineer, reporting upon the proposal, points out the unfairness, in view of the costly nature of early pioneer plant, of reducing the periods for repayment of loans, and also reminds the County Council that the long period loans were granted to pioneer undertakings like St. Pancras in order to encourage the development of a new, and what at that time might be termed an experimental venture. No objection is taken, of course, to the shorter period with regard to present-day loans, nor to the policy of writing off the amounts of unpaid balances on machinery actually displaced by newer plant. This is actually being done at St. Pancras.

In view of these reports the Electricity Committee recommends that the proposition of the London County Council be not entertained, and that two representatives of the Electricity Committee and two of the Finance Committee be appointed to interview the London County Council Loans Committee. It may be mentioned that the Council has sanctioned the £15,000 for the Ljungstrom turbine, but has not so far sanctioned the other sum for the extensions at King's Road. A point to be remembered is that the Borough Council cannot be compelled to reduce the period for the earlier loans, and the object of the proposed conference is to discuss any difficulties which may be put in the way of sanction to the second sum of £26,788 for extensions at King's Road.

**Western Section of the I.E.E.**—At a committee meeting of the Western Section of the Institution of Electrical Engineers, held on Thursday, September 24th, it was unanimously decided that no meetings of the section should be held at present, as it was felt that owing to the war and the resultant unsettled state, the attendance at the meetings would be small.

TELEPHONY AND TELEGRAPHY  
(INCLUDING WIRELESS)

An article on page 534 deals with the telegraphic isolation of Germany, and also refers to the wireless signals which we still allow to be sent out. These are probably being sent by the large power station at Hanover or else from Nauen, near Berlin. Both have sufficient power to transmit to America. Another form of wireless station, however, is being rigorously suppressed, namely, the small stations in the United Kingdom, the owners of which have not obeyed the order to dismantle. A flagrant case in point was heard at the West London Police Court last Thursday. The culprit was a nineteen-year-old clerk named Watsdorf, who lived with his grandfather, a German. He had originally erected his wireless station in 1912, and, on being communicated with, he had applied for a licence which had been refused, and he had been requested to dismantle the station. On August 5th this year, however, it was discovered that he had a wireless plant in use, using a pole on the roof as an aerial and employing current from the Hammersmith electric light mains for transmitting purposes. From May 7th to September 13th last he had used 31 units of electrical energy for working the apparatus. Although of amateur make the apparatus was of a nature to work efficiently, to receive any powerful messages of English, French, or German origin, and to transmit about 100 miles by daylight or 150 miles at night. The aerial was dismantled by Post Office workmen, but it appeared from the evidence that the Post Office had suspected the prisoner of having used the apparatus subsequently. The prisoner was remanded on bail (£100).

There is no doubt that useful information is still being sent from this country to Germany, and the Post Office is wise in insisting on the suppression of all private wireless and in applying for the severe punishment of all owners of them who have not complied with the order to dismantle them. This order has been so widely discussed that no one can plead ignorance of it. Although no single station of sufficient power could be transmitting to Germany direct without having been detected, yet it is just possible (although perhaps not probable) that by means of a chain of small power stations with hidden aerials messages may be transmitted a few miles at a time, and thus get across the North Sea or the Channel. A comparatively small station with an aerial hidden in the roof of a house or carefully trained up a flagstaff floating the Union Jack, could transmit 100 miles. Such stations could also easily receive signals sent out by our own wireless stations, and also receive instructions transmitted from German wireless stations.

In our issue of September 8th we expressed the hope in these columns that the Government was not overlooking the necessity of laying additional cables in the English Channel, and we now learn that several new cables have been laid. It would not be advisable to give any indication of the position of these, and it must be sufficient to state that they are ample to maintain full communication with the Continent in any contingency. Moreover, the cable huts at the English and Continental ends of all Channel cables are well guarded against surprise attacks; and there have been no cases of any of our cables having been disturbed.

Mr. G. Marconi, says a Reuter telegram from Rome, has just completed a tour of inspection of all the wireless telegraph stations in Italy. He reports having found them in a state of perfect efficiency for any war emergency.

In connection with the transfer of the Post Office telephone system in Hull to the Corporation, it is stated that 184 of the old Post Office staff have agreed to transfer to the Corporation, whilst eighty-six have applied to the Post Office for transfer to other P.O. services.

The French Co.'s Cable between Paramaribo and Cayenne failed on September 29th, messages for French Guiana having to be directed "via Salinas."—The French Administration announced that Togo may again be communicated with via Cotonou-Lome at the same rates as before.—Deferred service was again permitted on the Eastern and Western cables as from the 1st inst., although power is reserved to suspend it again should cables be choked with traffic.—Telegrams to New Caledonia during the interruption of the cable may be sent by wireless via Brisbane.—The Italian Administration refuses to entertain applications for refund.—The Almeria-Melilla cable is interrupted, and that between Penongomera-Alhucemas is faulty, and telegrams for Melilla, Nador, Zeluán, Chafarinas, and Cabodeagua are being sent by boat from Malaga.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### TRADING WITH THE ENEMY

**A**LTHOUGH the Proclamation with regard to "Trading with the Enemy," published in our issue of September 17th, states that enemy character does not attach to limited companies incorporated in Great Britain or in friendly countries, yet it must not be assumed, as we fear has been done in some cases, that absolute freedom is granted as to trading with English branches of German firms, even if these branches be registered as limited companies here. We make no apology for returning to this matter, for the proclamation is not drafted as clearly as it might be, and several conflicting interpretations have been given to it. It is made clear, however, in the main clause of the proclamation that persons may not directly or indirectly supply to or obtain from an enemy country any goods, wares, or merchandise. Although in the strict legal interpretation of the words of the proclamation, therefore, an English limited company established here to sell German goods may not have "enemy character," yet it is obvious that anyone placing orders with them would run the risk of buying goods obtained from Germany indirectly through a neutral country. This would distinctly be a penal offence under the terms of the proclamation, and heavy penalties might be incurred. The same applies in the case of selling to such an Anglo-German firm if there is reason to suppose that the goods are "directly or indirectly" destined for Germany or Austria, or "for the use or benefit of an enemy." It is safest, therefore, as well as being a patriotic duty, to refrain from dealing with such firms, and to buy only goods from British manufacturers or their accredited agents.

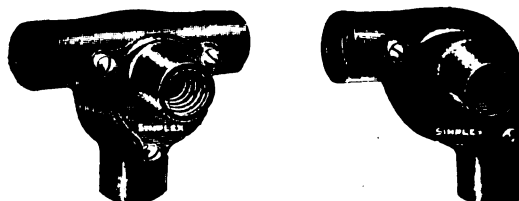
Many of our readers may have doubts as to the position of firms with whom they may contemplate doing business, so far as foreign share capital and foreign control is concerned, and inquiry is sometimes both difficult and delicate. To assist our readers in this connection we have made arrangements with the British Traders' Association (Balfour House, Finsbury Pavement, E.C.) to give confidential information on such matters in response to *bona fide* inquiries, and to charge only a nominal fee (2s. 6d. for inquiries as to Limited Companies and 1s. for inquiries as to private firms or individuals). Readers desiring to make use of this service should clearly explain for what purpose the information is required, and it is to be understood that both the requests for information and the replies are considered confidential.

**A Useful Adjunct to the Telephone Directory.**—A book that should be of considerable utility has been published by Messrs. Stone & Colquhoun (92 Victoria Street, S.W.) in the form of a "Key to the London Directory," which provides a means for ascertaining the name and address of a subscriber in the London area whose exchange and number only are known. Each number has opposite it a reference to the page on the ordinary directory on which it may be found, so that by not repeating the whole of the entries, the work can be kept within moderate compass.

**Coal Traffic.**—A very attractive booklet, entitled, "The Magnet of Commerce," issued by the Great Central Railway, gives a quantity of interesting information about the Midland, Lancashire, and North Wales coal fields, the preparation and distribution of coal, and its export. In this connection the company's new dock at Immingham is described. An excellent map is included, and there is much general information about the handling of coal in that part of the country served by the railway.

### NEW INSPECTION BOXES

**W**E illustrate here new patterns of outlet cover inspection bends and tees which have just been put on the market by Simplex Conduits, Ltd. (Garrison Lane, Birmingham).



SIMPLEX OUTLET COVER INSPECTION TEE AND BEND.

These provide an easy means of branching off from the main run of conduit to a light point and switch, and effect a considerable saving in labour and material, while making the neatest junction possible.

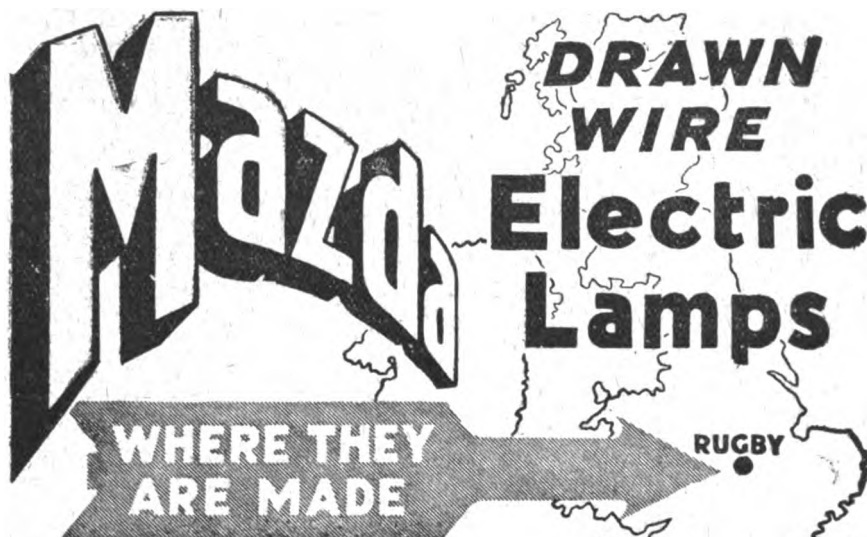
### ROYAL EDISWAN LAMPS

**A**VIGOROUS "All-British" campaign is being conducted by the Edison & Swan United Electric Light Co., Ltd., and a very effective full-page advertisement appeared in the *Daily Mail* last week emphasising in a happy way the British origin of Royal Ediswan lamps. Another new publicity venture of the Company is a neat little periodical entitled "Ediswan Electric Service," the first issue of which has just been produced. This forms an illustrated record of the progress of the manufacture of Ediswan electrical goods. Several of the latest artistic designs of fittings are illustrated, and there are articles dealing with a new reading lamp and the use of Ediswan fans, electric irons and other accessories in the household. The little periodical is attractively produced and has our best wishes.

### SCHAFER & BUDENBERG'S NEW WORKS

**T**HIS firm, established in Manchester in 1850, and of which Mr. Budenberg, who was born in Manchester, is the principal, have just removed to their new works at Broadheath, near Manchester. The new building, in which the firm's well-known steam pressure gauges and other specialities are manufactured, covers an area of 3,728 sq. yds., and is surrounded by land which has been acquired for further extension of the works when necessary. The building is of red brick, and consists of three floors. The south roofs of the building are of asbestos (slate pattern), through which the heat does not penetrate, while the north roofs are glazed, thus giving an excellent diffused light throughout the workshops and offices. The shops are electrically driven, the British Westinghouse Co. having been responsible for the installation.

In addition to their regular lines of high and low pressure gauges, the firm manufacture electric alarm gauges, gauges with adjustable contacts for switching compressor pumps, &c., on and off, continuous self-recording pressure gauges, tachometers, valves, &c. In these new works the various processes are to be seen in operation in connection with the making of clock movements, &c. Each gauge is marked under actual pressure compared with the test gauge, while the test gauge is compared at intervals with the open mercury column gauge specially erected in the building for this purpose. The very important process of dial marking is carried out in the printing and lithographic department adjoining the testing room. In other parts of the building the offices, laboratory, photographic departments, stock rooms with steel racks fitted for heavy goods, store and packing rooms, all having fireproof doors, are well arranged for the carrying on of the extended business which the firm's removal to Broadheath has necessitated. A precautionary measure against fire is the storage room for boxes, wood-wool, and other inflammable material, which is separated from the main building by a brick wall.



That they are British made is not their only virtue—they are unsurpassed for Economy, Brilliancy and Durability too.

*Recommend Mazdas and ensure satisfaction.*

THE BRITISH THOMSON-HOUSTON CO., LTD., Mazda House, 77, Upper Thames St., E.C. Branches in all large Towns.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**London: St. Pancras.**—In order to provide as much work as possible during the winter, the Electricity Committee recommends an overhaul of the cable system in order to abolish the old Henley distribution system. The renewals at present amount to from £1,500 to £2,000 per annum. It is now proposed to lay a new 0.8 sq. in. feeder and generally rearrange the cables at a cost of £4,650. It is also proposed to lay a 0.15 sq. in. three-core H.T. conductor between the two generating stations at a cost of £1,050 plus £200 for labour. The ducts were provided some years ago.

**Maidstone.**—Application has been made for sanction to a loan of £2,800 for new boilers.

**Tunbridge Wells.**—Twelve months' supply of high- and low-tension cable. Borough Electrical Engineer. November 7th. (See advertisement on another page.)

**Warrington.**—Sub-station ironclad switchgear. Borough Electrical Engineer. October 13th.

#### Wiring

**Birmingham.**—Electrical installation at Western Road House and Dudley Road Infirmary. Clerk to Guardians, Edmund Street. October 26th.

**Wirral.**—An expenditure of £700 is contemplated upon the electric lighting of the joint hospital.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdare.**—Hospital (£11,500).

**Belfast.**—Electric lighting of the operating theatre and wards at the infirmary. Consulting Engineers, Young and Mackenzie. Tenders to Clerk. October 13th.

**Blackburn.**—Reconstruction of Parkside Mill, Walter Street.

**Coventry.**—Technical school, Pool Meadow.

**Dewsbury.**—A consulting engineer is to report as to the electric lighting of the Guardians' premises.

**Hayward's Heath.**—New Post Office.

**London.**—160 wiring points at the Woolmore Street School, Poplar. Clerk, October 28th. (See advertisement on another page.)

**Mayo.**—Electric lighting of Castlebar Asylum (£3,000).

**Neath.**—Isolation hospital (£14,000).

**Northwich.**—School in Priory Street.

**Rhondda.**—Electric lighting and fittings at the electricity and destructor works, Appletree, Porth. Consulting Engineers, R. Hammond & Son, 64 Victoria Street, S.W. October 17th.

**Swansea.**—500 houses, Town Hill. Town Hall.

#### Miscellaneous

**Leeds.**—A loan of £32,000 is to be taken up for tramway extensions.

**London: L.C.C.**—Construction of tramway on overhead system from Lee Green to Eltham. Chief Engineer. October 13th.

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Bolton.**—A contract has been entered into with the Chloride Electrical Storage Co. for the maintenance of the storage battery.

**Manchester.**—A contract has been placed with the Liverpool Electric Cable Co. for cable.

**Rochester.**—The Kent Electric Power Co. has placed an order for seventy-three time switches for Rochester, with Vanner Time Switches, Ltd.

**Winchester.**—A contract for 105 time switches has been placed with Vanner Time Switches, Ltd.

**York.**—The tender of Edison Accumulators, Ltd., has been accepted for the supply of four electric omnibuses at £1,172 each.



# HOOPER'S

Telegraph and Indiarubber Works, London.

31, LOMBARD ST., E.C.  
(Established 1860.)

MILLWALL DOCKS,  
LONDON, E.

## Hooper's Vulcanised Indiarubber Cables for Electrical Work

maintain the highest quality, and their durability has been proved.

## PURE TAPE AND STRIP, etc.

Telegrams: "Linear, London," Telephone Nos. 1169 Ave. 84 East.

### LOCAL NOTES

**Brighton: Supply to Railway Co.**—An amendment to the new agreement with the London, Brighton & South Coast Railway Co. has for its object the inclusion of the yards in the term "workshop." Some objection was taken to this by several members of the Council on the ground that it would enable the Railway Co. to light its goods yards at the power rate, but Mr. J. Christie, the Borough Electrical Engineer, has no objection to the amendment as it is only intended to apply to the yards attached to the workshops, and not to the goods yards, sidings, and stations.

**Belfast: Proposed New Power Station.**—Mr. T. W. Bloxam, the City Electrical Engineer, has been instructed by the Tramways and Electricity Committee to prepare a complete scheme for extensions of the electricity undertaking, in conformity with the recommendations of Sir John Snell and Mr. W. J. Pratten, set out on page 527 of our last issue.

**Edinburgh: Emergency Work.**—The Electrical Engineer is to report upon works which might be undertaken immediately with a view to providing employment during the winter.

**London: Hackney: Motor-Converter Contract.**—The Electricity Committee has agreed to the release of the cash deposit of £800 made by Messrs. Bruce, Peebles & Co. in connection with the contract for six motor-converters for the sub-stations. An ordinary bond is to be entered into instead. The reason for asking this concession is the stringent monetary conditions existing at present owing to the war. At the same time, it should be pointed out that two of the six machines have been erected, two are in course of erection, and the remaining two were ready three months ago, but the Council was unable to take delivery. They are now in the hands of the Council.

**St. Marylebone: Heating and Cooking Prospects.**—The accounts of the Electricity Department for the June quarter show that whilst there is an increase of 7.84 per cent. in output over the abnormal June of last year, the lighting business is practically stationary. Mr. A. H. Seabrook points out in his report that although there is still a large field in the Borough for electric lighting, most of the possible consumers are those who have been secured by free wiring (piping), hire-purchase, and hire schemes. Although the Electricity Department does a fair amount of business by these methods, in order to increase it it will be necessary to put before consumers still more attractive methods of obtaining the installation, and these methods, in Mr. Seabrook's opinion, must consist in relaxing guarantees and spending considerable sums in free wiring, the cost being recovered by weekly or monthly payments. There is no

question, he adds, that the Department can make as great a success of this class of business as their competitors, and further schemes will be submitted to the Committee as time goes on. Whilst, however, the field for electric heating and cooking remains so promising, it is thought the best policy to concentrate efforts on securing this load.

**Sheffield: Transfer of Duties.**—The scheme by which the electric supply to the Tramways Committee will come under the direct control of Mr. S. E. Fedden and Mr. H. E. Yerbury, at present Electrical Engineer to the Tramways Department, as Assistant Manager of the Electric Supply Department, formally came into force last week. We gave details of the scheme in our issue for September 17th, p. 504.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, the following may be taken as the official quotation for electrolytic copper bars, viz., £54 10s. to £55. (Last week, £57 to £57 10s.)

**Change of Telephone Number.**—The telephone number of the Liverpool Branch of Simplex Conduits, Ltd., has been changed to Royal 4726 and 4727.

**Change of Style.**—The name of the firm hitherto known as Haslam & Schonheil, Ltd. (11 Windsor Place, Cardiff), has been changed to Haslam & Stretton, Ltd.

**Cryselco, Ltd.**—Mr. T. J. Grainger, who was Manager of the late Sunbeam Lamp Co., Ltd., has now joined Cryselco, Ltd., of Kempston Works, Bedford, as Sales Manager. His offices will be at 21 Moseley Street, Newcastle-on-Tyne. Telephone, Central 3474. Telegrams, "Cryselco, Newcastle-on-Tyne."

**Venner Time Switches.**—The Board of Trade approval has been given to Venner Time Switch Type "RB."

### APPOINTMENTS AND PERSONAL NOTES

A Clerk of Works is required for the Ilkley electricity undertaking. Applications to Town Clerk.

The Clyde Valley Electrical Power Co. invite applications from young engineers for positions as sub-station or switch-board attendants, and junior mains engineers. Applications to 53 Bothwell Street, Glasgow.



**Ladders, Steps,  
Trestles,  
Scaffolds, &c.**

Sale or Hire.

**HEATHMAN & CO.**

10, Parson's Green,  
London, S.W.

HEATHMAN'S PLAIN DECORATOR'S TRESTLES. MADE IN TWO WIDTHS. THE TOP TO TAKE ONE SCAFFOLD BOARD, THE TOP TO TAKE TWO SCAFFOLD BOARDS. "FOR SALE OR HIRE"

**BLAKE & INSULATING STAPLES**

Write for Samples and Prices.


**MOSSÉS & MITCHELL,**

Chiswell Works, 122-124, GOLDEN LANE, E.C.

**SEMI-INDIRECT**  
FOR  
OFFICE, AND  
SHOP, SHOWROOM

The advantage of diffused illumination are fully obtained by the use of these fittings.

The Benjamin Electric Ltd.



**ILLUMINATION**

No direct rays reach the eye, the lamps being entirely covered by the specially designed Opal Bowl.

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**ARMATURE  
REPAIRS**

**MARRYAT**

DYNAMO & MOTOR HOSPITAL,

28, HATTON GATE, LONDON, E.C.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 407 [VOL. X., No. 42]  
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THURSDAY, OCTOBER 15, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

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Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

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OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

Other Advertisement Rates on Application.

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Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

Corrections in Standing Advertisements, *Monday first post.*

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE electrical equipment of a large motor-car works is described in an illustrated article. (Page 542.)

THE "Museum" telephone exchange in London is described on page 543.

THE testing of transformer ratios is dealt with in our "Questions and Answers" columns. (Page 544.)

AN "unlicensed wireless" case is referred to under Telephony and Telegraphy. (Page 545.)

THE L.C.C. on Tuesday decided, without discussion, to proceed with its electric power scheme. (Page 545.)

SOME important lawsuits are on the list for hearing between now and Christmas. They include an application for a compulsory licence under the drawn-wire metal filament lamp patents, three actions for alleged infringement of the Osram patents (by the Pope, Gabriel, and Corona lamps respectively), an appeal against the injunction against the Long Eaton Urban District Council for using a differential system of charging, and an appeal by Messrs. Kirkland & Capper in the famous War Office case. (Page 545.)

SOME patent specifications relating to lamp-holders, plugs, and shade-carriers were published last week. Application is being made for the suspension of the Thermit rail welding patents. A patent of the B.T.-H. Co. relating to remote control circuit breakers expires this week after a full life of fourteen years. (Page 546.)

A NEW form of protection of flexible wires is described in our Trade Section. (Page 547.)

GENERATORS and switchgear for electric vehicle charging are required at Sydney; cable, conduit, and distribution pillars at Blackpool; meters at Gisborne (N.Z.); a 5,000-kw. turbo-alternator at Salford; new generating plant and cable at West Bromwich and Walsall.—A large quantity of lamps is required by the South African Railways' Administration, and telegraph stores by the North Eastern Railway Co. (Page 547.)

WE give a few particulars of the additional gas power plant at Accrington.—The Hove Corporation has decided to retain the electricity undertaking in its own hands.—The Maidstone Borough Electrical Engineer again deplores the absence of hire and hire-purchase powers. (Page 548.)

**The Institution of Electrical Engineers.**—The opening meeting of the Institution session will be held on Thursday, October 29th, at 8 p.m., when the President, Sir John Snell, will deliver his inaugural address. At this meeting a marble bust of Michael Faraday will be presented to the Institution by Mr. Llewellyn Preece, on behalf of the family of the late Sir William Preece.

**"Lethargy amongst British Manufacturers."**—A correspondent writes us as follows:—"I have read your 'Appeal to Manufacturers,' in ELECTRICAL ENGINEERING of August 20th, but I am afraid it has fallen on deaf ears. There is a lethargy amongst British manufacturers which is absolutely appalling. To give you an example:—My company has influential friends in Russia, and one of these parties wrote and asked us to find him an agency for aniline dyes. We wrote round to all the manufacturers, and the majority of the answers which we have had are that they are so busy, or that they are so overwhelmed (or something to that effect), that they cannot give attention to the matter. Other friends of ours in Russia have conditional orders with money deposited for enormous quantities of certain substances of which there is a very limited output in this country. One manufacturer, on learning that we could give him orders sufficient to keep his works busy for months, informed us that he was too busy already to consider these orders, as they would necessitate the expense of putting down another machine, and then, when the war was over, his new machine would be useless, as Germans would get the business again. This man does not appear to understand that Russia will not buy from Germany again if she can buy elsewhere, and our friends the Americans will probably capture the trade that England ought to get. Yet another example:—I am informed by the London agent of a provincial maker of high-class switchgear that he received an inquiry from Scandinavia for a certain starter which they had previously been purchasing from Germany for the price of £2. There is no doubt that this British maker could obtain the whole of that Norwegian business, but he stood on his dignity, and he would not condescend to manufacture the kind of stuff that the Germans make because it would injure his reputation."

**Arrangements for the Week.**—(To-day) Thursday, October 15th, Greenock Electrical Society, 21 West Stewart Street. "Alternating Current," by J. H. Parker, 7.45 p.m.—Saturday, October 17th, Birmingham Electric Club, Swan Hotel, New Street. "The Design and Re-Design of Industrial Works," by A. Home-Morton, 7 p.m.—Monday, October 19th, Institution of Post Office Electrical Engineers, I.E.E., Victoria Embankment. "Ethics of Supervision," by A. S. Renshaw, 6 p.m.—Friday, October 23rd, Physical Society, Imperial College of Science, Presidential Address on "Ionisation," by Sir J. J. Thomson, F.R.S., 8 p.m.

## ELECTRICAL DRIVING AT A MOTOR CAR WORKS

THE automobile construction works established by Arrol-Johnston, Ltd., some two miles out of Dumfries is a very fine example of an up-to-date factory, where, in accordance with the universal trend of manufacturing engineering, the fullest advantage is taken of the economies available from electrical driving of the machinery. We have been kindly sent a complete illustrated description of the electrical arrangements by the General Electric Co., Ltd. (Witton,

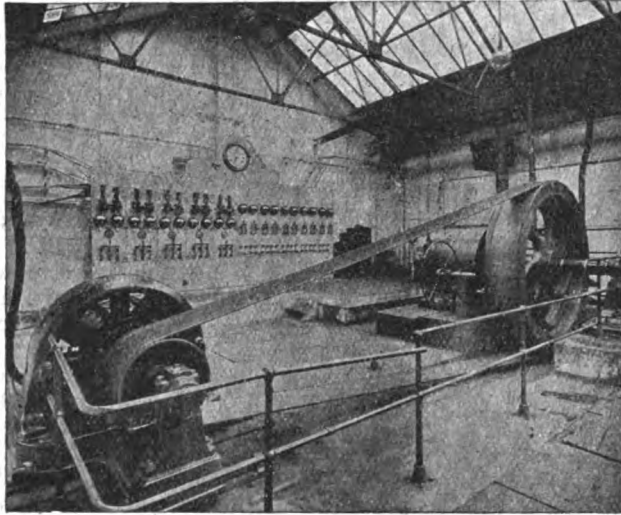


FIG. 1.—PART OF GENERATING PLANT.

Birmingham, and 67 Queen Victoria Street, London, E.C.), through whose Glasgow office the contract for the entire electrical equipment was carried out.

The power-house is driven from a suction gas plant, and contains generating plant aggregating 625 kw., comprising two 140-kw. and three 115-kw. Witton generators, belt-driven by slow-speed horizontal gas engines. A general view of part of the interior of the power-house, including the switchboard, is shown in Fig. 1. Power is generated at 220 volts, continuous-current, and is controlled by a switchboard of the open-type with five generator and five feeder panels. For lighting the works when the larger plant is shut down a

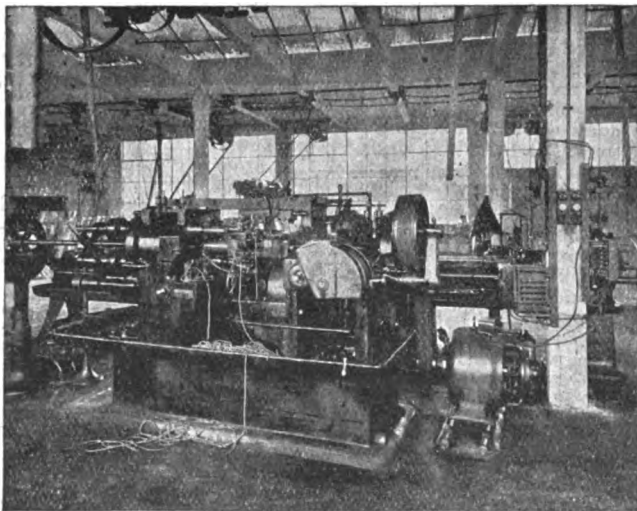


FIG. 2.—INDIVIDUALLY-DRIVEN AUTOMATIC MACHINES.

15-kw. gas-electric set has been installed in a smaller engine-house near by. The constructional processes have been so arranged that castings and raw material are taken in on the top floor and gradually descend as they are machined, and assembled, until the finished product reaches the ground floor. In the automatic machine shops the larger machines are individually driven, while the smaller ones are arranged in groups driven through Coventry chains by 20-h.p. Witton motors running at 1,100 r.p.m. An example of the individual driven machines is shown in Fig. 2, illustrating a four-spindle Gridley automatic machine driven by a 10-h.p. Witton motor. The motor-starter and a "Salford" switch controlling this and other similar machines will be seen on the right-hand

side. An idea of the extent of the automatic machine shop will be gathered from the fact that there are no less than twenty 20-h.p. groups of automatic machines. In the case of minor processes, it has been made a practice to group the necessary tools together and drive them from a 20-h.p. Witton motor fixed on the ceiling. Amongst the machines so driven are a number for running-in the gears, as well as saws and drills. In the Body Department the wood-working tools are also grouped.

One of the interesting details of the plant is a bank of machines for fixing the buttons on the cushions and upholster-

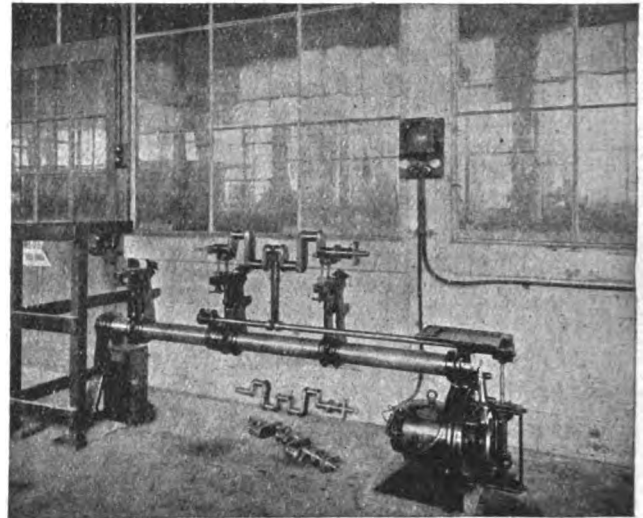


FIG. 3.—CRANK SHAFT TESTING MACHINE.

ing, splitting the leather and similar work. In the polishing shops a 25-h.p. Witton motor drives a long bank of polishing machines, the air from each of which is taken by means of a hood connected to a fan driven by a 5-h.p. Witton motor. Paint-shops usually offer little scope for electric drive, but here electric motors are used for driving air compressors and vacuum machines. The paint for the wheels is atomised and sprayed by compressed air, the operation being conducted in a hood from which the air is continuously exhausted, removing the paint fumes from the atmosphere of the room. At the moment only a 2-h.p. motor is installed, but a larger plant driven by a 20-h.p. motor will shortly be erected for spraying car bodies. Every part in an Arrol-Johnston car is thoroughly

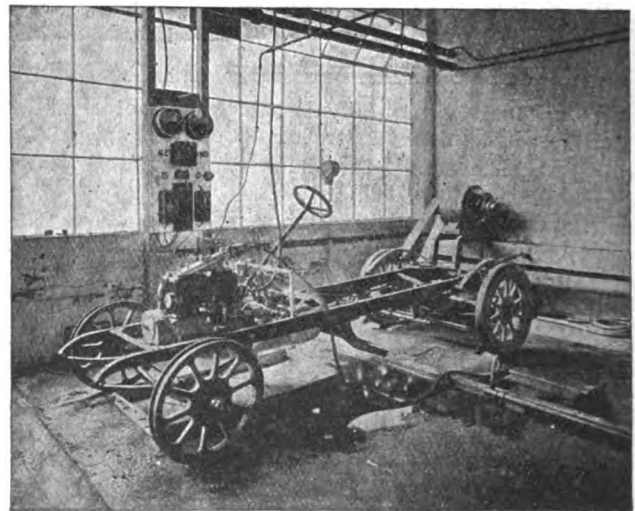


FIG. 4.—ELECTRICAL TESTING OF CHASSIS.

inspected before it is assembled, and an example of the thoroughness with which this inspection is conducted is offered by a crankshaft testing machine which is shown in Fig. 3. This machine is driven by a  $\frac{1}{2}$ -h.p. Witton motor, and the crankshaft is caused to rotate. If the crankshaft be out of balance it oscillates in position and automatically scribes itself at certain points which indicate where the metal needs to be taken off, and at the same time gives the operator an idea by means of a pointer showing the extent of the oscillations what amount of metal needs to be removed to secure perfect blancing. In the Car Testing

Department advantage has been taken of the facilities which electricity offers for the conversion of mechanical into electrical power, and its easy measurement, to adopt electrical methods for testing the cars. This department contains a number of car-testing beds, as well as engine running-in plants. Before testing, each engine is given a prolonged run, being driven direct by a Witton motor. When taken over to the testing-bed, the rear wheels of the car rest on the rollers coupled by a belt to a Witton dynamo. The engine drives the dynamo through the wheels and rollers, the energy generated by the dynamo being used up in a resistance situated outside the shop. The switchboard for measuring and controlling the power generated by the dynamo is seen behind the car. In this way precise information is gained as to the performance of the engine, and assurance is made that the engine is running to perfection.

The foregoing description gives but a small idea of the extent of the works. No mention has been made of the tool-room with its two 20-h.p. motors, the erecting shop with its 5-h.p. motor, the foundry with its one 15-h.p. and two 5-h.p. motors, the smithy, the copper-shop, and the numerous other situations in which Witton motors are installed for various purposes. The whole of the building is lighted by Osram lamps, there being 550 lighting points, and 150 plugs for power and light. Messrs. Claud Hamilton, Ltd., of Glasgow, were the contractors for the wiring. In conclusion we have to express our indebtedness to Mr. T. C. Pullinger (Managing Director of Arrol-Johnston, Ltd.) for permission to publish this article, and to Mr. Robert Bailie, the Company's electrician, under whose charge the electrical installation was carried out.

### THE "MUSEUM" TELEPHONE EXCHANGE

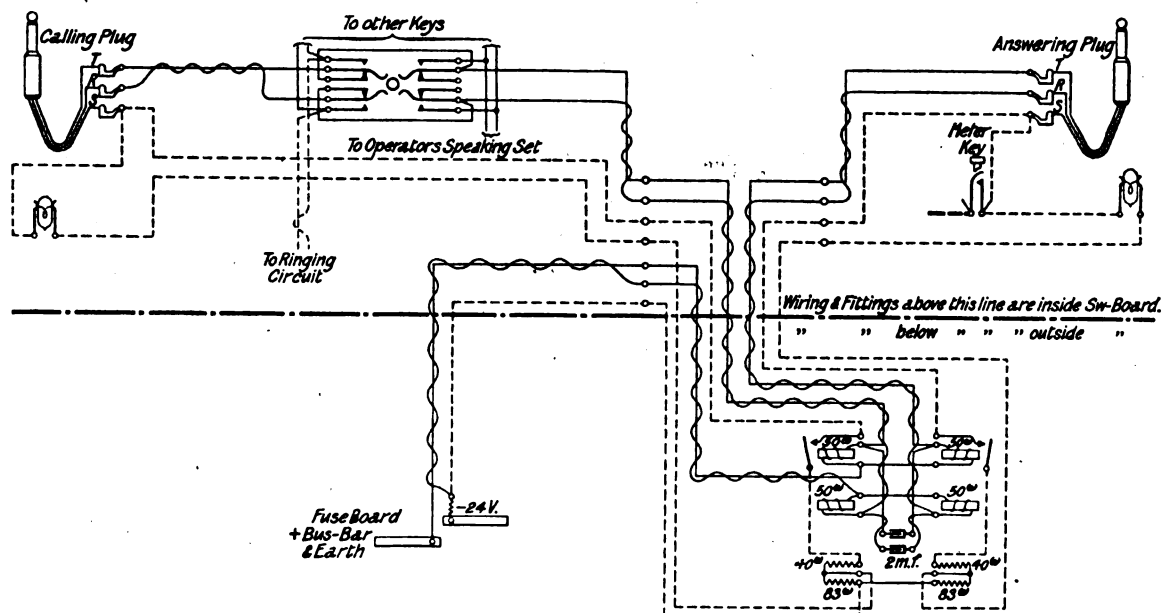
WE recently had an opportunity of inspecting the newest London telephone exchange, known as "Museum." The name is not intended to reflect in any way on the apparatus—which is of the most modern description—but is merely a roughly approximate designation of the locality in which the exchange is situated. It is in Chenies Street, Tottenham Court Road, a quarter of a mile from the British Museum. The exchange was opened last April with only 600 subscribers, and there are now 1,400. As it is practically fully equipped for 10,000, it is seen that there is plenty of provision for new subscribers in the district. It may be

is practically the Stone central battery system. Repeating coils are used on the cord circuits of the junction position only, and not on the subscribers' sections of the board. In the latter, the two halves of the circuit are connected through condensers, and the tip of the plug is connected directly to the battery through the supervisory relay and the ring of the plug to the battery through an equivalent retardation coil. The connections are seen in the diagram below. As indicated in this diagram also, all the relays, condensers, and retardation coils are placed on racks (which are at right angles to the switchboard), and not on the board itself. The only exception is the condensers and repeaters for the junction positions, which are on one rack in the apparatus room downstairs.

The switchroom contains 120 A positions and 42 B positions; two of the latter are for signalling junctions, the rest order wire. A nine-panel multiple is used on the A positions and a six-panel on the B positions. On the subscribers' board there are three operators' positions for every eight panels, and seventeen cords per position; and on the B board there are thirty junctions per position. In accordance with latest practice, the junctions have automatic ringing, so that on the insertion of the plug in the B position a relay connects the ringing circuit to the wanted subscriber's line, and he is continuously rung until he unhooks his receiver or until the originating operator clears. An interesting detail which we noticed is that the outgoing order wires, instead of being multiplied in the ordinary way and connected through solid, are each branched at tabs behind the board into four circuits which pass through break-jacks all together at a corner of the switchboard and thence to the order wire keys. Thus, if an order wire key becomes defective, it is possible to test at the break-jacks to see which of the four groups of keys it is on, and the remaining three groups need not be disturbed or the order wire itself put out of use. This arrangement has already been used in some other London exchanges, and has proved convenient.

The central battery is an eleven-cell Tudor battery with a capacity of 4,500 ampere-hours at the nine-hour rate. It is fully equipped with all its plates, and is contained in lead boxes. To prevent the boxes from bulging there are two wooden battens on each side of the box, braced together with heavy lead-covered iron rings.

There are two alternative sources of supply for charging the battery through the usual motor-generators; one from the County of London Co.'s mains at 590 volts D.C., the other from the Metropolitan Electric Supply Co.'s mains at



explained, however, that the exchange is not entirely for new subscribers, but also to relieve Gerrard, Mayfair, North, and even City and Central, upon all of which there have been several subscribers in the district now served by Museum.

The exchange is the largest one in London equipped by the Automatic Telephone Mfg. Co., Ltd., but it is not automatic; this Company, it will be remembered, took over all the telephone manufacturing done by the British Insulated & Helsby Cables, Ltd., a few years ago. The system employed

200 volts D.C. As usual, also, one ringing machine is run from the central battery and one from the supply mains.

We have to thank Mr. Slingo, the Engineer-in-Chief to the Post Office, for permission to view the exchange, and Mr. F. Woollard, the Assistant Sectional Engineer, for conducting us over it and explaining its characteristics to us.

Scottish Local Section of the Institution of Electrical Engineers.  
—All communications for the section should be addressed to Mr. J. Taylor, Hon. Sec., 153 West George Street, Glasgow.





each other; hence the L.T. connections of one transformer must be reversed. If now no deflection is observed when the supply voltage is raised, the ratio of the transformer is correct, but care must be taken to see that no open-circuit exists in the secondary circuit. This can be done by switching off supply momentarily and moving the dial switch to 53 or 55 (in this case), and on closing main switch again a reading should be observed if secondary circuit is continuous. If an exact ratio cannot be obtained on the standard transformer the nearest higher and lower ratios obtainable should be tried, and the ammeter should indicate first in one direction, and then in the other, showing that the correct ratio is between the two. If, when the transformers are connected in opposition, the ammeter indicates with the correct standard ratio, then each coil of the transformer under test should be tested separately until the fault is located. The supply voltage must, of course, not be greater than that of the H.T. side of the transformer to be tested; but in any case a maximum limit of, say, 2,000 volts should be fixed, this generally being the maximum the standard transformer will stand.

### PENDING ELECTRICAL LAWSUITS

**A**MONG the cases down for hearing in the Michaelmas sittings which have just commenced is an application for a compulsory licence under the drawn-wire metal-filament lamp patents in rather interesting circumstances. The Robin Electric Lamp Co., Ltd., own a patent taken out by Mr. J. T. Robin for a double-filament lamp. The lamp contains two independent filaments of the same size, connected to two pairs of contacts in the cap, and by an ingenious arrangement of a ring round the cap (which is of special shape) the lamp can be turned in the holder when the first filament burns out, and is thus given a new life. The Company apparently were not particularly desirous of manufacturing the lamp filaments themselves, nor even the lamps, but they have been unable to come to arrangements with any of the firms working under the drawn-wire patents which would enable them to put the new lamp on the market at what they consider a sufficiently low price. They therefore applied last year to the Board of Trade for a compulsory licence under the patents in question, in accordance with Section 24 of the Patent Act, and the Board have remitted the case for trial in the High Court. The case should come before Mr. Justice Sargant within the next few weeks, if not postponed, and a stiff fight may be anticipated. The Robin Electric Lamp Co., Ltd., have applied for a compulsory licence under the Siemens patents 20,277/04, 3,174/07, 19,932/08, and the B.T.-H. patents 21,513/06, 16,530/07, 23,499/09, 2,759/10, 8,031/10, and 17,722/11, and they have retained Mr. Bousfield, K.C., and Mr. Cave, K.C.

Three other important actions for alleged infringement of the Osram lamp patents are also down for hearing in the Chancery Division. Two of them, against Pope's Electric Lamp Works, Ltd., and the Gabriel Lamp Co. respectively, will come before Mr. Justice Joyce, whilst the third, against the Corona Lamp Works, Ltd., is on Mr. Justice Sargant's list.

Two other lamp patent cases in which writs are known to have been served do not appear on the list. One of these was against Messrs. Dick, Kerr & Co. and W. H. Scholey & Co., alleging infringement of the B.T.-H. patents by the "Britannia" lamp; it is doubtful whether this will be proceeded with, as there are reports of a settlement being probable. The other is against Duram, Ltd., and the companies which use their filaments; it is also being brought by the B.T.-H. Co., but presumably the preliminary stages are not completed yet.

Two interesting appeal cases will be heard. The first one, which comes from the Chancery Division, is an appeal by the Long Eaton Urban District Council against the judgment of Mr. Justice Sargant (ELECTRICAL ENGINEERING, May 14th, p. 266), who held that a supply authority has no right to charge different rates of power depending on whether or not the consumer lights his premises by electricity. Incidentally, it may be mentioned that an action relating to preferential charging and hiring without powers at the instance of the Ilford Gas Co. against the Ilford Urban District Council, is not on the list for this sittings.

The second appeal case is of considerable importance to consulting engineers, relating, as it does, to the liability of the consulting engineer under contracts. In this instance, Mr. Justice A. T. Lawrence, in the King's Bench Division, held that Messrs. Kirkland and Capper, Consulting Engineers to the War Office for the wiring of the Royal Army Medical College and Laboratories at Millbank, were negligent in permitting lead-covered wire to be placed under plaster without other protection, and gave damages against them and the

architect. We reported the case in our issues for April 23rd, p. 224, and May 14th, p. 267.

The action by Venner Signs, Ltd., against Stella Signs, Ltd., for alleged infringement of patents, referred to in our issue for June 25th, p. 369, has already been settled by the Stella Co. giving the necessary undertaking.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

On another page will be found a description of the "Museum" telephone exchange, one of the new exchanges opened in London this year. In this connection it is interesting to note that the Engineering Department of the Post Office is not slackening its work in any way, and that, after allowing for the men who have joined the colours, there are still some 17,000 at work. Last year 5½ millions were spent by the Post Office on construction work, and this year it is probable that the above amount will be considerably exceeded. The equipment of full automatic exchanges in the provinces is proceeding. As is known, Epsom and Hereford are already working, and automatic exchanges in Stockport, Dudley, Blackburn, Purley, Accrington, Chepstow, and Grimsby are in course of construction. With the exception of the "official switch" at the G.P.O., no full automatic exchanges are contemplated in London itself.

At the West London Police Court on Thursday, Morgan Adolf Watsdorf, nineteen, a clerk, living at Shepherd's Bush, was charged on remand with working a wireless telegraph apparatus without a licence. We reported the first hearing of the case in our last issue. No further evidence was given, and the prisoner was committed for trial, bail being refused. The case was down for hearing at the Central Criminal Court to-day, but had not come on when we went to press.

On the 6th inst. the lines between Saigon and Bangkok failed, but were repaired on Monday.—Brazil has prohibited the use of wireless on ships in territorial waters, and has instituted censorship, &c., on all telegrams, which must be written in plain language.—The Cape St. Jacques-Doson cable was repaired on the 9th inst.—The Sitka-Valdez cable gave out on the 11th inst., and traffic is, as usual, being sent *via* Ashcroft, excepting for Juneau, Skagway, Ketchikan, Wrangel, &c.—The Ottoman Government again permits the use of abbreviated or code addresses in telegrams for Turkey.—The following cables are still down: The Pacific cable and those between Tsingtau and Chefoo and Tsingtau-Shanghai, Australia and New Caledonia, Azores-Emden, La Réunion and Mauritius and Madagascar and Réunion.

**London Electric Supply.**—At the meeting of the London County Council on Tuesday it was agreed, without discussion, to promote next session the electric power scheme for London, details of which were given in our issue for July 30th, p. 428. The deputation from the Islington Borough Council to the conference between the L.C.C. and the London Boroughs with regard to the scheme has reported that the general view at the conference seemed to be that the Borough Councils are not yet in possession of sufficient information to enable them to form a judgment as to whether the scheme will be beneficial to them or not. The London County Council, we understand, has promised to furnish the Boroughs with further particulars. The Press was not admitted to the conference in question.

**L.C.C. Cable Employees' Rates of Pay.**—The following rates of pay have been decided by the arbitrators appointed by the Electrical Conciliation Board to consider applications from the leading and ordinary cable hands employed on the southern section of the L.C.C. tramways, and wiremen and wiremen's labourers in the electrical section of the Tramways Department, for increases in rates of pay. The arbitrators consisted of Sir D. Harrel (Chairman), Sir A. K. Butterworth, Mr. R. J. Smith, K.C., Mr. C. W. Bowerman, and Mr. J. N. Bell. Leading cable hands at present receiving 8d. per hour are to receive 8½d.; those receiving 7½d. to receive 8d.; and ordinary cable hands at present receiving 7d. to receive 7½d. These increases date as from July 20th, 1914. Wiremen in the Depot Wiring Department at present receiving 9½d. are to receive 10d. from May 14th, 1914, and to receive any increase subsequently granted to the wiremen at the Central Repair Depot before April 3rd, 1916. Wiremen's labourers' wages to be increased from 6½d. to 7d., and from 7d. to 7½d. respectively as from July 20th, 1914.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published October 8th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications. Names in italics indicate communicators of inventions from abroad.

20,725/13. **Lamp Holders.** E. DONSON (Foster Engineering Co.). In these lampholders fixed contacts are used instead of spring plungers, and the outer case with the bayonet slots is capable of axial movement relatively to the contact carrier, and is held back normally by a spring. It is, however, provided with additional bayonet slots engaging with pins on the base, so that it can be locked in the pulled out position when it is desired to break contact with the lamp without removing it from the holder. Seven figures.

20,990/13. **Electric Torch.** J. AIKMAN. A small magneto generator is contained within the body of the torch actuated through gearing by pressure on a knot with a free wheel return arrangement. This charges a small accumulator which supplies the lamp. One figure.

22,926/13. **Plug and Socket.** E. H. LEONARDT. The interior of the socket is similar to a lamp holder with the spring plungers replaced by split pins, and surrounded in place of a shade ring by a screwed skirt fitting round the plug. Over this skirt is a series of springs which engage with a collar on the plug to retain it in place when inserted. Two figures.

26,657/13. **Shade Carrier.** T. MCCLELLAND. This very simple shade carrier clips on to the lamp-holder in the position usually occupied by the shade ring, and is made of a piece of wire shaped to form a partial ring, and having its ends projecting to form legs. One leg is bent in such a manner that when pressed against the other it causes the ring to expand so that it can be disengaged. Four figures.

9,611/14. **Track Circuits.** W. H. DAMMOND. In order to eliminate the effect of foreign currents, the track circuits are arranged with an additional line conductor as a three-wire system, and a special three-wire electromagnetic relay is adopted. One figure.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Arc Lamps:** DOWDELL [Contact devices] 5,693/14.  
**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B. T.-H. Co. [Power systems] 21,689/13; HUNTINGDON [Cable suspenders] 231/13.

**Electrometallurgy and Electrochemistry:** NIBLETT [Electrolytic apparatus] 24,560/13; ASHCROFT [Electrolytic preparation of alkali metals, alloys and compounds] 25,144/14.

**Heating and Cooking:** THOMAS and THOMAS [Ovens] 22,402/13.

**Ignition:** HOLLISTER [Magnetos] 21,472/13; BLUEMEL and BLUEMEL BROS., LTD. [Spark plug] 719/14.

**Incandescent Lamps:** BASTIAN [Glow lamps] 21,029/13.

**Switchgear, Fuses and Fittings:** GOULTON [Signs] 21,191/13; WALLER and RODWAY [Fuses] 23,492/13; HOLT and SMITH [Circuit breakers] 25,477/13; OLMSTEAD [Voltage regulators] 26,623/13.

**Telephony and Telegraphy:** CREED, and CREED, BILLE & Co. [Telegraphy] 19,125/13; KENNEDY and TURNER [Telephone exchange apparatus] 21,921/13; GELL [High speed telegraphy] 22,146/13.

**Traction:** BLACKALL and JACOBS [Signalling] 13,157/13; WOLLERS, McCAW and WOLLERS [Electric lock for carriage doors] 12,982/14.

**Miscellaneous:** GADD and WESTERN DENTAL MANUFACTURING Co. [Electrically heated dental hot air syringes] 21,997/13; TUDOR [Bells] 30,017/13; DEAN [Electric horns] 5,346/14; T. CROSBEE & SONS and ROGERS [Alarms] 10,473/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, &c.:** KETTERING & AUR. [Engine starters] 13,057/14.

**Electrochemistry:** GES. FÜR ELECTRO OSMOST [Electro-osmotic treatment of materials] 19,849/14.

**Incandescent Lamps:** DEUTSCHE GASGLÜHLICHT A.-G. [Incandescent lamps] 19,729/14.

**Switchgear, &c.:** MOULIN [Limiter of discharge of batteries] 10,511/14.

**Miscellaneous:** GEB. SULZER [Governors for petrol-electric vehicles] 13,706/14.

### Applications for Suspension of Patents

10,859/01 and 24,439/02. **Alumino-thermic Welding.** H. GOLDSCHMID (Essen, Germany). Applications for the suspension of these patents made by W. L. Turner and H. A. Blackwell will be heard on October 21st. These patents cover the well-known process of "Thermit" welding more particularly as applied to tramway rail-joint welding.

6,116/12. **Electric Control of Compressed Air Brakes.** W. HILDEBRAND and KNORR, BREMSE A.-G. (Berlin). A licence under this patent has been granted on the application of Allen West & Co., Ltd.

### Amendments Made

5,210/09. **Sparking Plugs.** B. HOPPS. This specification, which is for sparking plugs with the inner electrode secure by a fusible refractory enamel, making a gas-tight joint, has been amended with a view to limiting the scope of the invention claimed.

17,124/13. **Indicating Apparatus.** SIEMENS BROTHERS & Co., LTD. (Siemens & Halske A.-G.). This specification has been amended by way of disclaimer. It relates to the electrical transmission of the indications of observing instruments such as range-finders, in which several instruments are used, and the arithmetic mean of their observations automatically transmitted.

### Expiring and Expired Patents

The following Patent expires during the current week, after a term of fourteen years:—

18,617/00. **Circuit Breakers.** B. T.-H. Co. (E. M. Hewlett, U.S.A.). Oil or other high-tension circuit breakers controlled from a distance in which the contacts are closed through a mechanism by an electric motor, but opened quickly by a spring arrangement independent of, but controlled by, the motor.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Electrochemistry and Electrometallurgy:** H. A. IRVINE [Electric furnace] 13,032/01.

**Heating and Cooking:** F. KRUPP A.-G. GERMANIAWERFT [Electric air heater] 9,449/08.

**Switchgear, Fuses and Fittings:** A. E. VOSS [Flashers] 13,361/08.

**Traction:** H. LEITNER and R. N. LUCAS [Train Lighting] 12,945/05.

**Miscellaneous:** A. P. JONES (Long Arm System Co., Cleveland, U.S.A.) [Electric door opening and closing apparatus] 13,927 & 8/04; H. H. LAKE (Ingersoll Sergeant Drill Co.) [Control of electrically driven air compressors] 12,778/05; C. O. BASTIAN [Mercury vapour lamps] 13,158/05.

**The Association of Supervising Electricians.**—This Association held its first meeting of the session at St. Bride's Institute, Ludgate Circus, on September 29th. Some eighty members and visitors assembled to hear the Presidential address, which was followed by a Paper dealing with Private Generating Plants, read by the President, Mr. A. H. Dykes. A reference was made to the necessity of having an Association to bring into closer touch with one another, supervisors and foremen of the electrical contracting trades. An interesting discussion followed, and a number of technical questions which had been asked, were explained by the lecturer, Mr. W. R. Rawlings,

who is an Honorary Member, made a brief speech congratulating them on bringing together such a large number of members, so thoroughly representative of the electrical contracting trades. The hon. secretary announced a series of Papers, which will be read during the session, the respective subjects, amongst others, being:—A.C. Commutator Motors, Wiring Systems, D.C. Motors, Telephones and Lightning Conductors. The inaugural dinner will be held at the London Tavern, Fenchurch Street, on November 28th. Particulars of the Association and rules can be obtained from the Hon. Secretary, Mr. C. J. Banister, 14 Pulborough Road, Southfields.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**LANTERNS AND FITTINGS.**—A new supplementary catalogue has been issued by the Wardle Engineering Co., Ltd. (196 Deansgate, Manchester), with an attractive cover depicting a scene in an Indian town, where the company's "Barrow" system of street lamp suspension is used. A number of patterns of shop front and general exterior lanterns are listed, as well as semi-indirect fittings, some for half-watt lamps, and fittings for suspended street lighting. Owing to the difficulty in obtaining supplies of sheet zinc and other materials, this company has been obliged to advance prices by 10 per cent.

**ELECTRIC BELLS.**—The Sterling Telephone & Electric Co., Ltd. (210-212 Tottenham Court Road, W.), have sent us a leaflet relating to a cheap metal case bell which they are selling at a very low price. It is stated to be British made throughout, and the Company announce that the large extensions completed some time ago at their works in Dagenham, have made them entirely independent of supplies from the Continent. The Company also announce an advance in their rate of trade discount.

**METAL FILAMENT LAMPS.**—A leaflet from L. Andrew & Co. (2 Whitworth Street West, Manchester) gives prices of "Wrendal" metal filament lamps of British make.

**PRINTING PRESS DRIVING.**—A leaflet from the Igranic Electric Co., Ltd., describes their latest form of push-button control with solenoid starter suitable for small rotary printing machines driven by single motors.

### "THERMOID" FLEX

A NEW type of flexible cable has been introduced by W. T. Henley's Telegraph Works Co., Ltd. (Blomfield Street, E.C.), under the name "Thermoid," for use with electric heating and cooking apparatus. The conductors are of steel and copper wire, and this not only ensures strength and flexibility, but is also a safeguard against kinking, so that for such apparatus as electric irons the new cable should be very suitable. The insulation is specially designed to be heat resisting, and the outside covering is of worsted and glacé cotton to render it flame resisting. Three sizes are listed—4 ampere (equivalent to 20 S.W.G.), 6 ampere (equivalent to 18 S.W.G.), and 10 ampere (equivalent to 16 S.W.G.). It is made either ordinary twin or circular twin, and, as the prices are moderate, it should have an extended use. Messrs. Henley's invite applications for samples from anyone in the trade.

**Ozonair and Recruiting.**—It is of interest to know that on the occasion of Mr. Asquith's recruiting speech at Cardiff on Friday, the 2nd inst., representations were made to those who were attending to the arrangements that the Premier was troubled with asthma, and that an Ozone generator should be installed under the table at which he was to speak, for the purpose of giving him relief. At very short notice this matter was taken up by the Corporation Electric Supply Department, and the local branch of the Edison & Swan United Electric Light Co., Ltd., who communicated with Ozonair, Ltd., by telephone. The latter firm sent down one of their Ozonair machines, and this was installed in an adjoining room, the ozonised air being brought by means of a tube to a position under the Premier's table. It is understood that the result was an unqualified success, and this is proved by the vigour of the Premier's speech, which was no doubt largely instrumental in giving a great impetus to the recruiting movement in South Wales. Incidentally it may be stated that over 50 per cent. of the staff of Ozonair, Ltd., have enlisted in the National Services, and that one of their men is a Naval Reservist and was among those who were fortunate enough to be saved from the *Hogue*, and has now joined another cruiser.

**Trading with the Enemy.**—The Oliver Arc Lamp Co., Ltd., have sent us the following circular letter received from an Amsterdam firm—whose name we suppress for obvious reasons: "Dear Sirs, We herewith beg to inform you that we are in a position to supply you *all Continental electric articles* advantageously. Should you require anything, we should be glad to hear from you. Yours truly ——" The words in italics are spaced out in the letter and underlined. Needless to say the Oliver Company—and we hope none other of our readers who have received this letter—are likely to avail themselves, in present circumstances, of the services of a firm desirous of supplying *all Continental articles*.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—The Sydney Corporation requires generators and switchgear for electric vehicle charging. Town Clerk. December 21st. Specification may be seen at 73 Basinghall Street, E.C.

**Blackpool.**—C.I. distribution pillars; H.T. and L.T. cable; earthenware conduit. Borough Electrical Engineer. (See advertisement on another page.)

**Bromley Cross (Lancs.).**—A Local Government Board inquiry was held last week concerning a loan of £3,815 for an electric lighting scheme. Power is to be supplied by the Lancashire Electric Power Co.

**Dover.**—Several extensions of mains are to be carried out.

**New Zealand.**—A supply of D.C. meters is required by the Gisborne Council: Electrical Engineer, Carnarvon Street, Gisborne. December 5th. This information, of course, is only of value to firms having agents in New Zealand who can be instructed by cable.

**Salford.**—Sanction to a loan of £13,500 is to be applied for. It is proposed to instal a 5,000-kw. turbo-alternator at the Frederick Road power station.

**Southport.**—The borrowing of £10,000 for the general purposes of the electricity undertaking is contemplated.

**Teignmouth.**—An agreement has been entered into with Dr. Purves, of Exeter, with regard to an electric supply scheme.

**Walsall.**—A loan of £23,595 is to be sought in connection with the electricity undertaking.

**West Bromwich.**—Sanction has been received from the L.G.B. for the borrowing of £5,547 for new generating plant and cable.

#### Miscellaneous

**Glasgow.**—A twelve months' supply of lamps and fittings for the Glasgow Parish Council and District Board of Control. Clerk, 266 George Street. October 26th.

**North-Eastern Railway Co.**—Six or twelve months' supplies of telegraphic material are required. Telegraph Superintendent, York. October 23rd.

**South Africa.**—The South African Railways Administration require 14,080 incandescent lamps, and 39,150 train-lighting lamps, all wire-drawn filaments. Tenders to Headquarter Offices, Johannesburg. November 2nd. This information is only of use to firms having agents in South Africa who can be instructed by cable.

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**London: L.C.C.**—The tender of Davidson & Co. has been accepted at £4,898 10s. for four induced-draught fans at the Greenwich Generating Station. The motors will be supplied by the B.T.-H. Co., and the starting switchgear and resistances by Brook, Hirst & Co.

On page 473 of our issue for August 27th we referred to the contract given to J. Batt & Co. for the supply of 3,000 driving and 2,000 pony wheel tyres for L.C.C. tramcars. Messrs. Batt, as agents for a Cologne firm, were unable to carry out the contract at the time of our previous note; but the contract had not been cancelled, as the firm was then endeavouring to find a British firm to take it over as sub-contractors. At that time, however, the L.C.C. had also ordered a similar quantity of tyres from Messrs. H. Besemer & Co., whose tender in July was the next lowest, viz., £1 3s. each for the driving wheel tyres, and £1 each for the pony wheel tyres, compared with 19s. 4d. and 16s. 7d. respectively quoted by Messrs. Batt. The Highways Committee now report that in addition a contract has been placed



with Cammell, Laird & Co. for 500 driving wheel tyres at 22s. each and 500 pony wheel tyres at 19s. each, as Messrs. Batt are unable to fulfil their contract.

The following tenders have been received for the supply of 125,000 metal-filament traction lamps: Siemens Bros. Dynamo Works, £6,313 2s. 6d.; alternative tender, £7,816 5s.; Edison & Swan Co., £7,816 5s.; Electric Co., £7,816 5s.; General Electric Co., £8,450. The tender of Siemens Bros. Dynamo Works at £6,313 2s. 6d. has been accepted, the amount to be increased to £6,628 15s. 8d. if frosted bulbs are required.

### APPOINTMENTS AND PERSONAL NOTES

Mr. J. H. Clothier, Chief Electrical Engineer to the St. Anne's-on-Sea Corporation has received an increase of £50 per annum in his salary.

The Newcastle-on-Tyne Electric Supply Co. has vacancies for junior assistant engineers. Applications to the Engineer, Carville Power Station, Wallsend-on-Tyne.

Mr. J. Hammersley has been appointed Resident Engineer in Manchester for Home-Morton, Ker and Gibson, Consulting Engineers.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, the following may be taken as the official quotation for electrolytic copper bars, viz., £55 to £55 10s. (Last week, £54 10s. to £55.)

**Business as Usual.**—Notwithstanding the fact that Mr. Curtis, of the Curtis Manufacturing Co. (Conduit Place, Paddington), has joined the Engineer Unit of the Royal Naval Division, and is in camp at Martin Mill, this firm inform us that business in continuing as usual in his absence.

**Italian Agency.**—A Palermo firm desires to get into communication with United Kingdom manufacturers of electrical material, including metal-filament lamps. Further particulars at 73 Basinghall Street, E.C.

**Liquidations.**—The statement of accounts in the liquidation of the Consolidated Diesel Engine Manufacturers, Ltd., shows gross liabilities of £72,492, of which £43,222 is expected to rank, and assets estimated to produce a surplus of £240,078. The deficiency as regards shareholders is returned at £358,878. Mr. W. J. Warley, the official receiver, said it was agreed that there had been great want of judgment on the part of the Directors, but there was not sufficient ground upon which to found any claim against them. Sir William B. Peat, who was appointed Special Manager a short time ago, recommended that the works at Ipswich, in which some work is still going on, should not be sold, but that the opportunity be taken to let them temporarily to the Military Authorities for the accommodation of troops. This was done, but the arrangement has now come to an end. Sir William Peat has been appointed liquidator.

Mr. Justice Neville, in the Chancery Division on Tuesday, made a compulsory winding-up order against the Leitner Electrical Co., Ltd. Application was made on behalf of Alfred Herbert, Ltd., who have a debt under an ordinary contract amounting to £650, and it was supported on behalf of Messrs. Greenwood and Batley, who have a debt against the Company of over £2,000. There is also another creditor for a similar amount.

**Bruce Peebles and the War.**—Mr. R. Shaw, Chief Estimating Engineer to Bruce Peebles & Co., Ltd., Edinburgh, has joined the Engineer Units of the Royal Naval Division, and Mr. W. Oliver has been appointed temporarily to fill Mr. Shaw's position. Since the outbreak of hostilities well over one hundred members of the staff and works have joined the Forces, and unfortunately the firm have already received intimation that one of their men has been killed in action.

**The Leskole Co., Ltd.**—The business of this Company, formerly carried on at Palace Works, Enfield, has been taken over by the Cambridge Scientific Instrument Co., and Mr. F. Wakeham, Assistant Manager to the Leskole Co., has joined their staff.

### LOCAL NOTES

**Accrington: Additions to Gas Power Plant.**—The scheme of duplicating the existing gas-engine driven generating plant which has been entrusted to the Power Gas Corporation comprises two 1,000-h.p. gas engines with exhaust boiler coupled to a 750-kw. alternator, and a 750-kw. dynamo, both by Bruce Peebles & Co. When the installation is complete the gas plant at the power-house will consist of 4,000 h.p. The engines are being made by the National Gas Engine Co.

**Bacup: Transfer of Management.**—Hitherto electricity has been supplied to and distributed in Bacup by the Rawtenstall Corporation, but the Bacup Corporation has now decided that, whilst continuing to take energy from Rawtenstall, it will take over the actual management of the distribution itself.

**Hove: Electricity Undertaking.**—The Corporation has at last decided to retain the undertaking of the Hove Electric Lighting Co. in its own hands. It will be remembered that the undertaking was recently acquired by the Corporation on a valuation; but considerable doubt has existed as to the future management of it. Several offers to lease the undertaking have been received, but under the advice of Sir Alexander Kennedy none of them were considered sufficiently attractive. Mr. C. B. Smith, the Engineer who managed the works on behalf of the Company, is continuing to do so as an official of the Corporation.

**Edinburgh: Public Lighting.**—A short time ago the Electricity Committee agreed to reduce the price for public lamps from £9 to £7 10s. per annum, including all-night and half-night lighting. The Corporation has now decided to do away with the half-night lights, and the question has been raised as to how far this materially alters the situation as regards the reduced price. The reduction in lighting was not contemplated when the lower price was agreed to, and the matter has been remitted to a Sub-Committee to deal with.

**Leeds: Purchase of Roundhay Co.**—The L.G.B. has sanctioned a loan of £17,600 for the purchase of the Roundhay & District Electric Lighting Co.

**Maidstone: Electricity Accounts.**—After meeting capital charges amounting to £5,790, there was a surplus of £712 upon the working of the electricity undertaking last year, in spite of very adverse circumstances. The price of coal was 40 per cent. in excess of that of the first half of 1912-13, whilst the new plant which was expected to be ready in October, and from which great economy will be obtained, was not available until nearly the end of March. Thus, during the whole winter it was necessary to generate a large proportion of the output by the small uneconomical sets, with bad results to the coal costs. The output for every class of supply shows an increase, whilst in the supply for power there was a record increase of over one-third of a million units, and once again Mr. E. E. Hoadley, the Borough Electrical Engineer, deplores the absence of powers to hire and hire-purchase the necessary apparatus. There are signs, however, he says, that the possession of powers will not be very much longer delayed. The recent additions to the power plant consist of an 825-kw. Belliss-E.C.C. set, which has a steam consumption of 18 lb. per unit generated, compared with 36 lb. with the old sets.

**Southampton: Report on Electricity Undertaking.**—The joint report by Sir John Snell and Mr. Ernest Edmonds dealing with the general position of the electricity undertaking and the policy hitherto pursued in connection with it (ELECTRICAL ENGINEERING, August 6th, p. 452) came before a special meeting of the Corporation last week. The discussion resolved itself for the greater part into acute differences of opinion between certain members of the Council, and a large number of personalities were indulged in. Several speakers seemed disinclined to accept the opinions of the authors of the report, notwithstanding, it was alleged, they had been responsible for the calling in of the experts. At the end of a long meeting, at which it cannot be said that anything of a practical nature was done, the report was referred to the Electricity Committee, who in turn is to report to the Corporation. The cost of the expert advice amounts to £593 16s., and one member expressed the opinion that this sum was being paid for advice identical in every respect to that already given by their own Borough Electrical Engineer, Mr. H. F. Street.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 408 [VOL. X., NO. 43]  
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THURSDAY, OCTOBER 22, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE Darlington telephone exchange just opened, is the first in this country to employ the Western Electric Co.'s full automatic system. The features of this are the employment of registers and the reversionary impulse control system of operating, the use of rotary sequence switches to displace a large number of relays, and power drive (p. 550).

An illustrated article explains the working of the "split conductor" system of mains protection (p. 551).

A PATENT specification by C. O. Bastian for lamps with helical wire filaments was published last week. Other specifications published at the same time deal with automatic sending apparatus for wireless telegraphy, telephone indicators, circuit breakers, &c. Application has been made for the suspension of certain patents for magnetic clutches. A Marconi wireless telegraph patent expires during the coming week (p. 552).

A MOVING stairway has been opened at the Baker Street station of the Bakerloo and Metropolitan Railways (p. 553).

THE subject of illicit wireless stations is again dealt with in our notes on telegraphy, &c., this week (p. 553).

SOME new heating apparatus is described in our

Trade Section, which also contains an illustrated article on apparatus for drying transformer oil (p. 554).

A QUESTION relating to the effect of overloads on meters is propounded in our "Questions and Answers" columns (p. 554).

FURTHER information regarding German trade is available to inquirers at the Board of Trade (p. 555).

THE Armorduct Manufacturing Co., Ltd.—the bulk of whose capital is held in Germany—endeavoured without success to recover a debt of £1 10s. 6d. in the City of London Court. The judge said that the defendants, who acknowledged the debt, but had refused to pay because they considered the plaintiffs a German firm, had honestly discharged their obligation to this country (p. 555).

CABLE is required at Blackpool, Tunbridge Wells, and Pontypridd; generating plant at Ashton-under-Lyne, Connah's Quay, Heywood, Keighley, and Turton; an electric lighting scheme is to be put into force at Waterford.—Street lighting equipment is required at Swinton (p. 556).

OWING to the shortage of arc lamp carbons at Bury St. Edmunds, high-candle metal filament lamps are to be adopted for street lighting.—A dispute has arisen at Maidstone with regard to the Electrical Engineer's bonus.—It is proposed to place the Leeds Electricity Department under the management of a separate Committee.—The Walsall Electricity Committee has decided to deal in electrical fittings (p. 556).

A 4 PER cent. dividend has been paid by Drake and Gorham for the year to June 30th, 1914.—Although a larger profit was made by Dick, Kerr & Co. for the year to June 30th than in the preceding twelve months, no dividend is to be paid (p. 557).

## INSTITUTION OF ELECTRICAL ENGINEERS' PROGRAMME

THE following is the list of Papers arranged for the first half of the 1914-15 session of the Institution of Electrical Engineers: Oct. 29th, Inaugural Address by the President; Nov. 12th, "Cables," by C. J. Beaver; Nov. 26th, "Power Plant Testing," by W. M. Selvey; Dec. 10th, "Automatic Protective Switchgear for Alternating-Current Systems," by E. B. Wedmore; Jan. 14th, 1915, "The Shape of the Pressure Wave in Electrical Machinery," by Dr. S. P. Smith and R. S. H. Boulding; Jan. 28th, The Sixth Kelvin Lecture: "Lord Kelvin's Work on Gyrostatics," by Prof. A. Gray, LL.D., F.R.S.

Arrangements for the Week.—Friday, October 23rd. Physical Society, at Imperial College of Science, South Kensington. Presidential Address by Sir J. J. Thomson, F.R.S., on "Ionisation," 8 p.m.

Thursday, October 29th. Institution of Electrical Engineers. Presidential Address by Sir J. F. C. Snell, 8 p.m.

## THE W.E. CO. AUTOMATIC EXCHANGE AT DARLINGTON

DARLINGTON has become a town of great importance in the telephone world, for the Darlington telephone exchange, with its 600 telephone subscribers, is the first in which the new automatic system of the Western Electric Co., Ltd., has been adopted. The exchange, which was opened a few days ago, has automatic equipment designed for an ultimate capacity of 2,800 subscribers, and an initial capacity of 800.

This is the third automatic telephone exchange to be opened by the British Post Office. The first was at Epsom, on the Strowger system, which had been previously installed for the "official switch" at the General Post Office in London for intercommunication between the various offices, and is also being put in at several other small exchanges in various parts of the country; and the second was the Hereford exchange, in which the Lorimer system was tried, a system possessing some features of merit and novelty, but apparently no longer an active competitor in this country.

The Western Electric system differs from the Strowger in many points. Instead of the impulses sent out by the subscriber's dial switch acting directly on the various selectors, they are received, in the first place, by a "register," which "stores" them and then actuates the group and final selectors by what is known as the "revertive impulse" control method. Another feature of the system is the employment of a "sequence switch" associated with each selector, which controls the necessary sequence of operations which would

No. 0 sends 10 impulses, No. 1 nine impulses, No. 2 eight impulses, and so on. Each series of impulses is received by a register spindle (Fig. 2), there being a spindle for each digit, and as each spindle is moved a step forward for every impulse the spindles are set to the number desired.

It would occupy too much space to describe in detail the translation of the number registered to the group and final selectors, but the principle is briefly as follows: The register spindle only rotates in one direction, and as it has been set to the complementary number to the number on the subscriber's dial, the remainder of the revolution to reach normal position corresponds to the actual number required—or, to be accurate, to the actual number *plus* one extra impulse required for operating purposes. The spindle of the selector (Fig. 3) is started as soon as the register is set, and as it rotates it sends an impulse back to the register, which moves it on one step, and so on until normal is reached and the selector is then stopped at the number required. This describes the procedure very roughly, without reference to the operations of the sequence switches nor the connection to the junctions between the group selector and the final selector, but it will be sufficient to indicate generally the revertive impulse control method.

Provision is made for the engaged tests and the operation of the "busy-back" if the called subscriber is engaged, the ringing of the subscriber if disengaged, the automatic operation of the originating subscriber's meter only if the called subscriber answers, and the final disconnection when the conversation is concluded.

The junctions at Darlington are dealt with at a manual board. When an automatic subscriber desires to make a call to another exchange, he "dials" No. 12 and gets connected

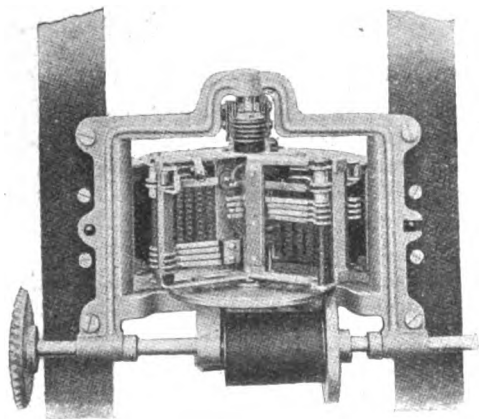


FIG. 1.—LINE-FINDER.

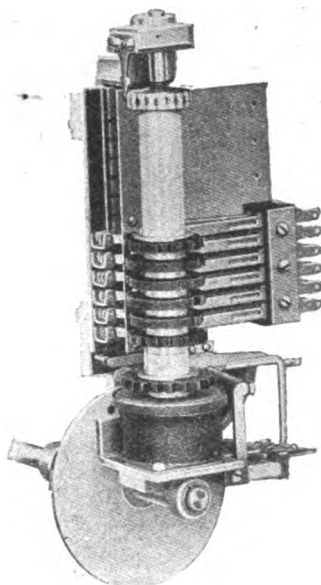


FIG. 2.—REGISTER SPINDLE.

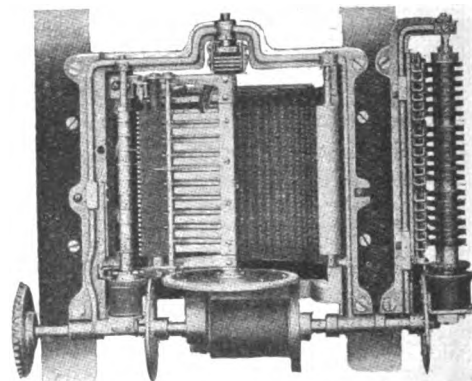


FIG. 3.—GROUP SELECTOR AND SEQUENCE SWITCH.

otherwise have to be done by a large number of relays. In this connection it is interesting to note that, whereas the new Betulander system, recently described in our columns, is based on the principle of replacing selectors by groups of relays, the Western Electric has been replacing relays by a rotary switch mechanism. All the switches for completing the connections are, in fact, rotary—the vertical field, familiar in the Strowger system, is not employed. Another point of interest is that the system is power driven.

The first operation when a subscriber calls is that a "line-finder" connects his line to a free register. This line-finder is illustrated in Fig. 1. Each line-finder has terminals for 60 subscribers' lines arranged in the form of a segment of a circle over which three sets of brushes are driven, and there are eight line-finders for every group of 60 subscribers. As soon as a subscriber originates a call and operates his line relay, this energises a starting relay common to the group of line-finders, which in its turn energises a clutch magnet and starts in rotation as many of the eight line-finders that are free. These rotate until one of them finds the calling line.

The connection between the line-finders and the "registers," already alluded to, is effected by means of sequence switches. There are 30 of these registers, and each connection circuit has, through a sequence switch, the opportunity of testing six registers to pick an idle one. As soon as the register is in circuit, which in most cases will be almost instantaneously, the subscriber receives a buzz on the line (of quite a different nature to the busy-back), and he then starts sending impulses from his finger dial switch in the usual way. The impulses transmitted are complementary to the numbers on the dial, that is to say,

to a junction position. If he wants to make an inquiry, he dials 14, and gets on to an inquiry operator. If he wants to send a telegram he dials 2600. In-coming junction calls for an automatic subscriber are dealt with by the junction operator by a calling device of the finger-plate type. Originating calls from coin-box subscribers reach a position on the manual board, to enable the operator to supervise the insertion of the coins, and a special line and cut-off relay equipment is provided for the purpose. These subscribers have ordinary C.B. sets; they can, however, be reached in the ordinary way on the automatic board for in-coming calls.

It will be seen that the arrangements have been well thought out, and everything points to successful working. Readers desiring more detailed information with regard to the apparatus and circuits are referred to the July number of the *Post Office Electrical Engineers' Journal*, which contains a long article on the exchange by Mr. J. Hedley, and also to an excellently illustrated book on the Western Electric Machine Switching System, issued by the Western Electric Co., Ltd.

**The Magnetite Arc Lamp.**—An article in the *Electrical World* describes recent improvements in magnetite or "luminous arc" lamp in the way of a new electrode with a large proportion of titanium, raising the efficiency in some cases as high as 0.54 watts per mean spherical. The useful distribution of the light has also been improved by prismatic reflectors.

**The "Dynamicables."**—The committee of this club has decided not to hold any dinners this side of Christmas.

## THE SPLIT CONDUCTOR SYSTEM OF MAINS PROTECTION

ALTHOUGH the "split conductor" system for the automatic isolation of faulty feeders—an improvement on the Merz-Price system, so far as cable protection is concerned—has been in use for some considerable time, and many mains in the Newcastle district and elsewhere are equipped with it, yet we believe that no full description of the method has yet been published. Through the courtesy of Electrical Improvements, Ltd. (Milburn House, Newcastle-on-Tyne), we are now able to explain its details fully to our readers.

The system, which is covered by Patents Nos. 4,004 and 26,857 of 1911, has the advantage that the instantaneous automatic disconnection of the faulty feeder is effected with the simplest arrangement of apparatus and without the use of pilot wires. Its

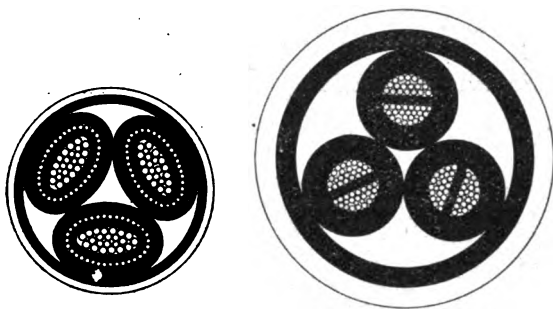


FIG. 1.—THREE-CORE SPLIT CONDUCTOR CABLE [6,000 VOLT].

FIG. 2.—THREE-CORE SPLIT CONDUCTOR CABLE [20,000 VOLT].

operation is based on the fundamental principle that two similar conductors of equal length, when connected in parallel at their ends, carry equal currents. The core of each feeder is divided into two equal conductors, as shown in Figs. 1 and 2, being lightly insulated from each other—in the case of an overhead line, however, the two conductors corresponding to each core are carried on separate insulators. In either case, at the extreme end the two conductors or "splits" of each core are connected together through a device which operates the switch in the event of the currents being unequal (see Fig. 3).

The principle upon which the operating device depends is as follows:—The two splits are taken through windings of a current transformer connected to produce fluxes in opposition, so that the net effect with equal

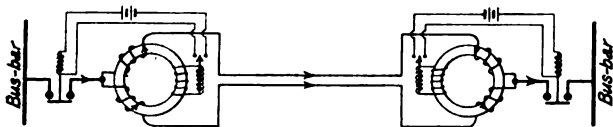


FIG. 3.

currents is no magnetisation of the core, and no current is induced in the third or secondary winding. As soon, however, as the currents become unequal, a resultant magnetic flux is produced in the core, and the secondary winding becomes energised and operates the relay. Such an arrangement can be adjusted to work with difference of current in the two conductors of a few amperes only, but, in actual practice, the setting of the relay is determined by the degree of equality obtained in the current through the two conductors, and the relay is set so as not to operate with the largest difference of current likely to occur in the two conductors while there is no leakage of any account. The diagram is drawn for one phase only, but the connections and the current transformer are repeated on each of the three phases.

An essential of all such systems of mains protection

is that the feeder must be disconnected at both ends immediately a fault occurs. Consideration of Fig. 3 will make it clear that at any end of a feeder the extent to which a given leakage will affect the disparity of currents (i.e., the automatic device) will vary with the position of the leakage in the length of the feeder; the effect will be greater the nearer the leakage is to the end in question. Should the leakage occur at the extreme end of the feeder as indicated in Fig. 4, the difference between the two currents in the "splits" at the opposite end will be a minimum, and a comparatively large leakage might be required to trip the switch. To provide against this, an arrangement of apparatus indicated diagrammatically in Fig. 4 is em-

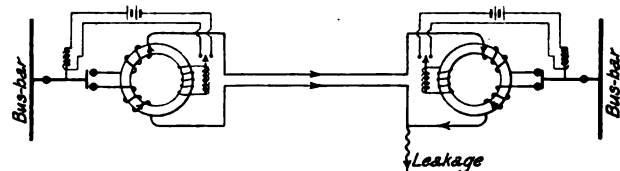


FIG. 4.

ployed. It will be noticed that the direction of the flow of current in one of the windings of the current transformer nearest the leakage is here reversed, i.e., the transformer becomes inductive, and therefore offers impedance to flow of current through it to the leakage. This effect increases the disparity of currents in the other current transformer, and operates the relay. If maximum sensitiveness is required without unduly large current transformers the circuit-breaker is arranged (as shown in Fig. 4) so that, when it operates, the two conductors are separated from one another as well as from the bus-bars. This leaves the leakage on one conductor only, and produces immediate operation of the relay at the other end. The arrangement of

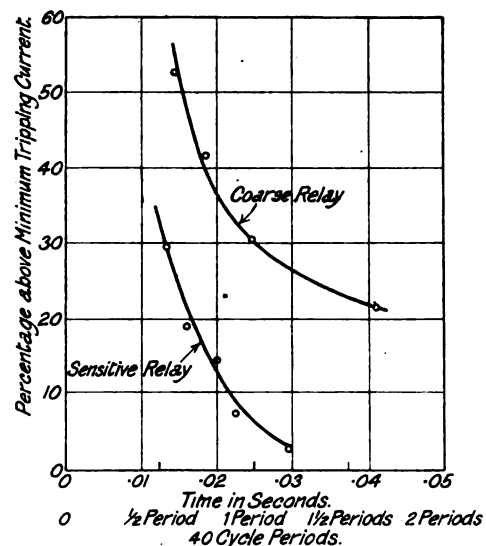


FIG. 5.

dividing the circuit-breaker contacts in this way is equivalent to a current transformer of infinite impedance, and is generally adopted in preference to a current transformer of large impedance.

Figs. 1 and 2, already referred to, illustrate alternative constructions of split conductor cable, and Fig. 1 has the advantage over ordinary cable that, due to the larger curvature caused by the increased over-all size of the core on account of the insulation between the split conductors, the potential stress on the insulation is reduced. This advantage is of importance in the case of cables for working pressures of 20,000 volts and over.

A difficulty which might be anticipated with both



forms of split conductor cable shown, is the possibility of both splits of one core developing equal leakage, due to being damaged simultaneously. But the two alternating current arcs would, in the nature of things, have a constantly varying resistance, and it is very unlikely that the damage would be such that the two fault currents were equal, to within a few amperes, at precisely the same instant. In the case of Fig. 1 in particular the probability of equal currents is remote. The curve in Fig. 5 indicates the fraction of a second for which one conductor would have to carry a slightly larger current than the other to ensure operation of the relays. The relays in question were standard apparatus, not specially prepared for the test.

Another consideration affecting this matter is that the fault would, in a short time, affect the other cores of the cable, and if in any one of the three pairs of

split conductors the leakage current did not balance, this would be sufficient to energise one of the three current transformers, and so actuate the tripping coil of the switch.

The insulation between splits is tested after the cable is laid, for half a minute, with a pressure equal to full working pressure between the core and earth. This is to ensure against breakdown of the insulation due to a potential difference between the splits produced by the drop in one of them when carrying leakage current. Such a test represents a very substantial margin over the worst conditions which would occur in practice, particularly when it is borne in mind that under working conditions there is no potential difference between these conductors, and no stress on the insulation. It is therefore in condition for withstanding momentary pressure.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published October 15th, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

19,125/13. **Wireless Transmission.** F. G. CREED and CREED, BILLE & Co., LTD. Transmission apparatus in which the main signalling circuit-breaking devices are actuated by compressed air controlled either by hand through remote-control circuits or by a Wheatstone or other automatic apparatus. Three figures.

21,029/13. **Metal Filament Lamps.** C. O. BASTIAN. Lamps with wire filaments in helical form, with the convolutions arranged at a distance from one another equal to or less than one-half the diameter of the wire. Two figures.

21,921/13. **Telephone Indicators.** D. H. KENNEDY and J. W. TURNER (H.M. Postal Telegraphs). A telephone indicator which, when operated by an electromagnet, is mechanically locked in the operating position, and is automatically unlocked when a second electromagnet is energised or automatically or mechanically unlocked by some act of the operator, and while unlocked may be operated by an electromagnet automatic relay and returned to its original position when this relay ceases to be energised. Two figures.

25,477/13. **Circuit Breakers.** F. B. HOLT and H. SMITH. Circuit breakers with auxiliary contacts and additional sparking tips to open after the main contacts, and connected to a resistance or reactance mounted on the member carrying the contacts. Two figures.

26,623/13. **Voltage Regulators.** A. H. OLMSTEAD. Voltage regulators in which two contacts control the insertion of a resistance in the generator field, one actuated by an electromagnet connected to the generator circuit and the other vibrated by an electromagnet energised from another source, the armature being connected by a "lost motion" movement with a pivoted lever which carries a contact and makes or breaks the circuit of the magnet. Two figures.

5,346/14. **Electric Horns.** W. W. DEAN. An electric diaphragm horn in which the natural period of the armature reed is sufficiently high for the rate of oscillation when oscillated by an electromagnet not to be influenced, so that a clear, strong note is obtained over a considerable range of frequency. Seven figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Distributing Systems, &c.:** READ and BRANSOM [Control of electric supply] 22,348/13.

**Dynamos, Motors, and Transformers:** MORRIS, MORRIS & LISTER, LTD., and CATEAUX [Transformers] 22,394/13.

**Electrometallurgy and Electrochemistry:** DAVIES and A. GALLEN-KAMP & Co. [Resistance furnaces] 10,415/13.

**Heating and Cooking:** BASTIAN [Mounting resistances] 22,023/13.

**Incandescent Lamps:** BASTIAN [Glow lamps] 22,024/13.

**Switchgear, Fuses, and Fittings:** BRACKENSIECK [Lamp-holders] 28,915/13; GARDNER [Relay apparatus] 6,953/14; SHORT [Switch fuse] 8,456/14.

**Telephony and Telegraphy:** WESTERN ELECTRIC Co., NASH and GRACE [Lamp telephone signals] 22,405/13; BRITISH L. M. ERICSSON MANUFACTURING Co. and BROOKES [Intercommunication telephones] 13,567/13.

**Traction:** B.T.H. (G.E. Co., U.S.A.) [Electro-pneumatic brakes] 22,224/13; THOMAS TRANSMISSION, LTD., and THOMAS [Driving of road vehicles] 22,246/13.

**Miscellaneous:** MUNTZ [Selector for bells] 21,931/13; WOOLLOX [Flashing signal lamp] 24,093/13; WILSON [Electric cranes and hoists] 4,294/14; BOURSIN [Electromechanical engine starter] 10,480/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, &c.:** A. G. BROWN, BOVERI ET CIE. [Rotary converters with commutating poles] 24,337/13; SOC. ANON. DES ETAB. L. BLERIOT [Combined dynamo and accumulator system] 16,935/14 and 16,936/14.

**Meters:** LANDIS & GYR, LTD. [Prepayment meters] 20,146/14.

**Telephony:** SIEMENS & HALSKE A.G. [Grouping of subscribers' lines according to frequency of calls] 16,316/14.

The following Amended Specifications can now be obtained:—

B. HOPPS [Sparking plugs] 5,210/09; SIEMENS BROTHERS & Co., LTD. [Transmission of signals] 17,124/13.

### Applications for Suspension

13,067, 13,068, and 13,069/06. **Magnetic Clutches.** W. SCHUSTER and H. AST (Vienna). Applications for suspension of these three patents made by C. E. Lugard will be heard on November 3rd. These specifications describe improvements in magnetic clutches relating respectively to ventilating ducts, disengaging springs, and arrangement of windings.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

18,865/00. **Wireless Telegraphy.** J. A. FLEMING and MARCONI'S WIRELESS TELEGRAPH Co. This specification describes a system of producing Hertz waves in which a continuous-current dynamo controlled by a revolving contact maker is used to charge a condenser. The secondary of this condenser is connected to the aerial oscillating circuit. Two figures.

18,921/00. **Electric Furnaces.** G. BENEDICKS. Furnaces heating by means of an induced current in the material to be treated or in a conductor in contact with it, in which the inducing coil is on a central iron core surrounded by an annular heating chamber.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** VON ROHR [Reflectors for searchlights] 13,293/05.

**Dynamos, Motors and Transformers:** J. PHILLIPS [Commutator grinder] 13,142/01; CROMPTON & Co., J. C. MACFARLANE and H. BURGE [Motor converters] 15,494/09.

**Incandescent Lamps:** E. A. CAROLAN (G.E. Co., U.S.A.) [Lamp caps] 14,597/03.

**Switchgear, Fuses and Fittings:** S. G. BROUNGER and W. J. HAYWOOD [Rheostats] 14,814/03.

**Traction:** E. H. COCKSHOTT [Trolley heads] 15,147/09.

## ELECTRIC TRACTION NOTES

The interchange facilities between the Bakerloo and Metropolitan Railways at Baker Street became greatly improved last Thursday, when moving stairways, leading direct from the platforms of the latter line to the Bakerloo station beneath, superseded the existing means of connection. Passengers transferring from one railway to the other will be saved something like two minutes in making the change.

At a meeting last Friday of the Metropolitan Association of Electric Tramway Managers, Messrs. Ullmann (East Ham) and Schofield (Leyton) were re-elected Chairman and Vice-Chairman respectively, and Mr. Goodyer (Croydon) was re-elected Hon. Secretary.

The Secretary of the British Electric Traction Co. informs us that a large majority of each class of shareholders in the country, and of the income certificate holders, are in favour of the scheme for the reduction of capital. Under existing conditions, however, the Directors consider that the wisest course is to defer any further action in regard to the scheme for the present.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

On the subject of illicit wireless stations and the possibility of communicating information to Germany by their means, Dr. J. Erskine-Murray, in a letter to Monday's *Times*, says that he has before him a German technical publication describing experiments in which signals were transmitted from an aerial wholly indoors to a station over 150 miles distant. It would, he continues, be very foolish to suppose that the enemy has not taken all precautions to maintain the inland communications of his agents in this country independently of the ordinary postal telegraph system, even although such special means of communication may be reserved for communication with Zeppelins or other invading forces. Not only is it possible, he says, for anyone to use a telephone aerial wire for reception of wireless messages, but two subscribers can communicate telegraphically over an ordinary telephone, and even a trunk line, without the knowledge of the exchange operators, and without interrupting conversation on the line. Such messages, however, might be detected by a neighbouring wireless station. He suggests that the search for such illicit communications would be greatly facilitated by granting special licences to approved amateurs throughout the country, who, if thought advisable, could be sworn in as special constables, with instructions to keep day and night watch on all signals, and he offers to undertake the organisation of this service with the assistance of his colleagues of the Wireless Society.

The case of the young Hammersmith clerk who insisted on working a wireless telegraph apparatus without a licence from the Postmaster-General (*ELECTRICAL ENGINEERING*, Oct. 8th, p. 537, and Oct. 15th, p. 545) came before Mr. Justice Rowlatt at the Old Bailey last Wednesday, and ended in an unexpected manner. The Post Office decided to charge him only with having an unlicensed wireless telegraph apparatus at work in August, 1913, as they desired to take a lenient view of the case. It was explained that the boy had taken up wireless telegraphy as a hobby, with the object of fitting himself for the post of wireless telegraph operator, and that a large portion of the apparatus had been made by himself. It was not considered now that there was any ulterior motive in what the prisoner had done, nor that he had been of any help to the enemy. Mr. A. A. Campbell Swinton, as President of the London Wireless Telegraph Society, gave evidence on behalf of the defence. He said that he did not know the prisoner personally; but at the same time, in view of the facts which were now admitted on both sides, he asked that the prisoner should have every possible consideration. Mr. Justice Rowlatt said that, had it been proved that the prisoner had had his installation connected up since the commencement of war, hobby or no hobby, he would have given the fullest sentence which the law permitted, but, in the circumstances, he would impose imprisonment for two weeks, and the confiscation of the apparatus.

A sensational statement was published in the Press last Saturday and Sunday to the effect that a wireless telegraph

apparatus of long range had been seized at the house of Prof. Schuster (one of the Secretaries of the Royal Society), and to this the information was added that Prof. Schuster was born in Germany in 1851. Further inquiry, however, shows that the facts of the case were as follows:—The installation in question had been erected by Prof. Schuster under licence last June, for receiving time signals from the Eiffel Tower. When war was declared Prof. Schuster was away with the solar eclipse expedition, and the Post Office officials took down the installation and packed it in a sealed box and left it in the house, and last week the police came to remove the box. There has never been any suggestion that the installation has been used for, or was intended for, any illicit purpose.

In our last issue we published a list of some of the towns in which automatic telephone exchanges are being put in, but by a regrettable oversight we omitted to mention the three in which the equipment is most advanced. One of these is at Darlington, and has now just been opened; a description appears on another page. This equipment, it is seen, is on the Western Electric Co.'s system. Newport (Mon.) is also fairly well advanced, as is also Portsmouth; but they are still in the contractors' hands. The equipment of these will be on the Strowger system. At Leeds, also, an automatic exchange is to be installed; but it is awaiting the completion of a new building. With the opening of the Darlington exchange the Post Office will be able to compare three systems—the Strowger at Epsom, the Lorimer at Hereford, and the W.E. Co.'s at Darlington.

Our special article on "Germany's Telegraphic Isolation," in our issue of October 8th, was quoted in the *Times*, the *Morning Post*, the *Daily Graphic*, the *Globe*, the *Daily News* and *Leader*, the *Evening News*, the *Star*, the *Manchester Guardian*, the *Liverpool Daily Post*, the *Yorkshire Observer*, the *Wiltshire News*, the *Scotsman*, the *Dundee Advertiser*, the *Glasgow News*, the *Edinburgh Evening Dispatch*, the *Northern Whig*, and the *Cork Constitution*.

The first issue of the *Telegraph and Telephone Journal* has made its appearance. It is to be published monthly at the General Post Office, under the Editorship of Mr. W. H. Gunston, who was Editor of the *National Telephone Journal*, and Mr. John Lee and Mr. J. W. Wissenden act as an editing and organising committee. The journal is somewhat limited in scope, as technical engineering subjects are to be left in future to the *Post Office Electrical Engineers' Journal*.

The private telegraph service with Belgium is suspended.—The Sitka-Valdez cable was repaired on the 15th inst.—The Jupiter Inlet-Nassau cable is still down, and messages can only be sent by wireless in plain language, and subject to censorship of the United States.

**The Engineer Section of the R.N.D.**—At the meeting of the Institution of Mechanical Engineers on Friday, it was stated that up to October 10th, 500 men had enlisted in the Engineer Section of the Royal Naval Division. Three members of the Institution of Mechanical Engineers have been allotted commissions. There is also attached to the section a certain number of navvies and artisans, men whose families are dependent upon the separation allowance and such other allowances as are obtainable from the various funds, and a small committee has been appointed to see that these dependents obtain the allowances which are due to them. Two members from each of the three Institutions are on this committee, and on behalf of the Institution of Mechanical Engineers, Dr. Clark and Mr. W. H. Patchell are acting.

**Faraday House Journal.**—The current issue of this record of the doings of old and present students of Faraday House contains a list of 68 at present serving in the Allied forces, with some portraits. Of this list three are in the Flying Corps, a large number in special sections of the Royal Engineers, Army Service Corps, and Royal Naval Division, performing electrical and engineering duties. It is also recorded that three students who happened to be in Germany are detained as prisoners. Besides various interesting personal items, there are several illustrated technical notes on plant and apparatus of the companies who take students from the College.

**The International Electrical Congress, San Francisco.**—It is stated in the *Electrical World* (New York), that there is every probability that the International Electrical Congress which was to be held in San Francisco in connection with the Panama-Pacific Exhibition, will be postponed owing to the war.

**Prohibited Exports.**—An Order in Council issued on Monday prohibits the export of signalling lamps operated by electricity and capable of being used for signalling Morse or other code.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent,

draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,412.

A consumer, without notifying the supply authority, increases his load so that for one or two hours every day the load exceeds by 50 per cent. the rating of his meter. What will be the effect of such a procedure on the chief patterns of meter on the market, and what indication will the supply authority have that this has been done? It is of course assumed that the main fuses have not blown.

The replies to this question have not been of as high merit as usual, and the question is therefore repeated this week. Replies may now be sent up to *first post Thursday, October 29th*, and competitors who have already sent replies are invited to try again. The two points in question are, to what extent the 50 per cent. overload will be inaccurately recorded on the meter (and whether the error will be + or -), and if the supply authority can have any indication of the change in the load except by the fact that the amount registered is greater than usual.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### A NEW FORM OF HEATER

**A** HEATER which is designed to project beams of heat where required has great advantages in some cases of local heating. Such an apparatus has been provided by Simplex Conduits, Ltd. (Garrison Lane, Birmingham), and is illustrated here. The heating element is a coil of special non-oxidisable ribbon wound on a reinforced tube which is raised



THE PLEXSIM HEAT PROJECTOR.

to a red-heat. This glowing bar is laid along the axis of the polished copper conical reflector, by which the heat is projected in the required direction. The guard is open, so that it does not baffle the heat, and it is possible to dust the reflector without removing the guard. The element is supported at both ends and cannot sag, and the connector-box is strong and well ventilated.

### CALOR HEATING AND COOKING APPLIANCES

**T**HE latest designs of the Calor electric fire and other heating and cooking appliances are illustrated in a pair of new leaflets which Townshend's Art Metal Co., Ltd. (Ernest Street, Holloway Road, Birmingham), have prepared for overprinting with contractors' names and addresses. We are informed that considerable improvements have been made in the Calor fire with its glowing disc heating element, particularly in the strengthening of the element itself and the

simplification of the method of its replacement. These fires are installed on several British warships. The other heating and cooking apparatus includes several novelties, including an electric steamer in several sections, useful forms of immersion heater, and the boiling plate shown in Fig. 1. This is fitted with the same patented element as used in the fires, consisting of nichrome wound on a special clay base which can be

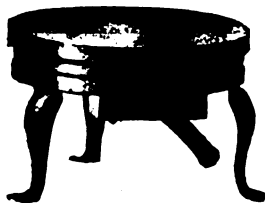


FIG. 1.—GLOWING HOT-PLATE. FIG. 2.—ELECTRIC COFFEE POT.

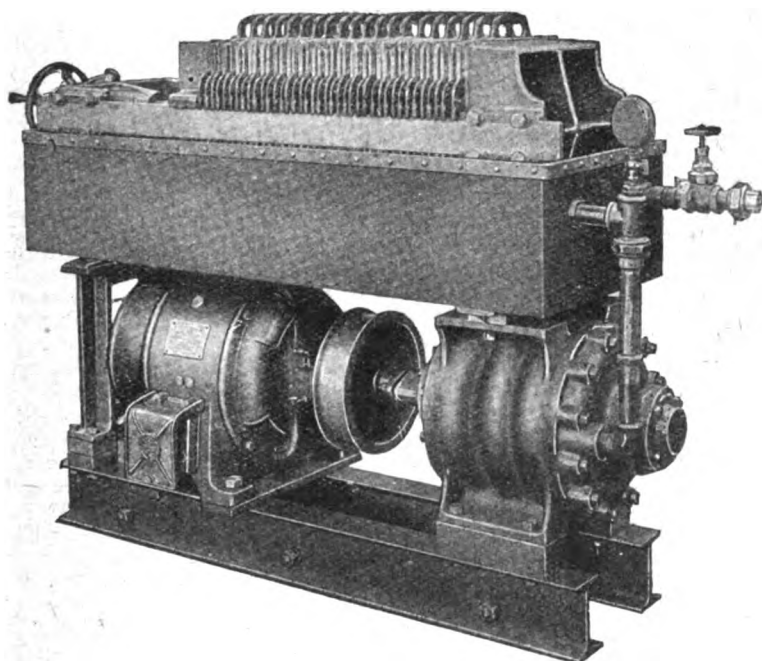
run at a dull red heat. It is very durable and is put on the market at a remarkably low price. Among other items we notice particularly the very practical-looking coffee pot shown in Fig. 2. Other apparatus comprises kettles, irons, toasters, hot-plates, grillers, &c.

**German Trade in Aluminium.**—The Board of Trade has issued a pamphlet with some statistics of the exports from Germany and Austria-Hungary of aluminium and aluminium wares to different countries. The total value of Germany's aluminium export in 1912 was £456,800. Particulars are also given of the markets in various parts of the world for aluminium wares. Copies of the pamphlet, with more detailed information, can be obtained from the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, E.C.

**A Directory of British Manufacturers for Russian Trade.**—With a view to assisting in the transfer of trade with Russia hitherto supplied by Germany, to British manufacturers, Mr. R. A. Lenski (114 Fenchurch Street, E.C.), has undertaken the preparation of a directory of British manufacturers under trade headings in the Russian language, and is inviting the co-operation of British manufacturing firms in the matter.

### DRYING TRANSFORMER OIL

IN view of the very great effect on the dielectric strength of transformer oil of even minute percentages of water, and the otherwise deleterious effects of sediment and impurities, the British Thomson-Houston Co. has developed the special apparatus illustrated here for freeing the oil from water, slime, and sediment by forcing it under pressure through several layers of dry blotting paper in a specially designed filter press. The oil is pumped under a pressure of from 25 to 100 lb. per sq. in. through a series of sheets of soft, dry, white blotting paper of special make. Most of the solid matter is caught in the first layer of paper, while the water is retained on account of the capillary attraction between paper and water being greater than between paper and oil. The paper is dried again after use in a special electric oven. The sheets of paper are supported on ingeniously arranged cast-iron plates with grooved surfaces. A large number of



DRYING AND FILTERING APPARATUS FOR TRANSFORMER OIL.

sheets are used, giving considerable filtering surface. Various styles of pump are used, according to the size of the equipment. The 12-in. 20-chamber size, with 30 sq. ft. of filtering surface, illustrated here, has a specially designed three-stage centrifugal pump, driven by a 7.5-h.p. motor, and passes 30 gallons per minute. An equipment of this size is in use by the Glasgow Corporation Tramways. When it was first adopted, transformer oil which had been in use for ten years was passed through the filter and tested with electrodes 0.05 in. apart. Before filtering, it broke down at 1,500 volts, but after once filtering required 10,200 volts for breakdown, and after twice filtering withstood 20,000 without breaking down. Another piece of apparatus is combined motor-driven fan and electric air-heater for driving a current of heated air through transformers, to dry them out thoroughly before filling them with oil, a matter of equal importance to the drying of the oil itself.

### THE ENEMY'S TRADE

IN connection with the campaign undertaken by the Board of Trade, on the advice of their Advisory Committee on Commercial Intelligence, to assist British manufacturers and merchants to secure trade formerly in the hands of German or Austro-Hungarian firms, the Board have received a very large number of inquiries for names of sellers or buyers of articles of which the sources of supply or markets have been interfered with by the war.

Special arrangements have been made in the Commercial Intelligence Branch of the Board of Trade for dealing with the inquiries, and lists are being prepared and circulated of articles which inquirers desire (a) to purchase and (b) to sell. The first and second lists were published on August 29th and September 18th respectively; the third list, in which is incorporated the first and second lists, is now ready, and may be obtained on application to the Branch. Firms

interested in any of the goods mentioned, either as buyers or sellers, should communicate with the Director of the Commercial Intelligence Branch, Board of Trade, 73 Basinghall Street, London, E.C.

The list of articles which the inquirers desired to purchase includes:—Beads for lampshades, bitumen and cases for flash-lamps, presspahn, celluloid battery cases for miners' lamps, china for electric fittings, clockwork mechanism for electrical apparatus, and the following electrical apparatus:—Accessories, accumulators, batteries for pocket flash-lamps, bells and pushers, brass caps for flash lamps, vulcanised rubber cables, carbon brushes for switches, carbons, celluloid cases, conduits and fittings, corrugated iron cases for transformers, dry cells, dynamos and motors for cars, illuminated signs, insulating links for switches, lamp sockets, magnetos, novelties, *papier maché* covers, plates and rods for batteries, sparking plugs, telegraphic and telephonic switches, vulcanite mouldings, zinc cells, glass-ware for arc lamps, fittings and accumulator boxes, jewels for electrical instruments, electric fans and heaters, lampshades, metal filament and arc lamps, pocket lamps, lamp-holders, lightning conductors, electric automatic machines, lamp-making machinery, magnets, copper, sheets for armature stampings, reflectors, mica, tungsten, molybdenite, insulating varnish, Roentgen-ray bulbs, spun silk for covering electric wires, non-magnetic watch springs, diamond dies for wire drawing.

The list of articles which inquirers desire to sell includes aluminium, electrical apparatus, magnets, mica, and tungsten.

The list of goods which firms abroad are open to purchase includes cables, electrical apparatus, accessories, fittings, and machinery.

Lord Lytton kindly offers to provide free sites for workshops at the Garden Village, Knebworth, Herts, 25 miles from London, for the production of articles hitherto imported from Germany. Applications should be made to Messrs. Pepler & Allen, 4 Arundel Street, Strand, W.C.

### A QUESTION OF PRINCIPLE

IN the City of London Court last week, before Judge Atherley Jones, K.C., the Armorduct Manufacturing Co., Ltd., sued Messrs. H. Defries & Co., electrical engineers, 59 New Oxford Street, for £1 10s. 6d. for trade goods supplied. Although involving so small an amount, the case is somewhat important as bearing upon the rights of a German-owned firm, trading in England as an English limited liability company, to recover debts during the period of war. Messrs. Defries & Co. did not dispute owing the amount; indeed, already £20 on account had been paid, but the balance of £1 10s. 6d. was refused on the ground that the plaintiffs are a German company, and consequently alien enemies. It was stated that the Armorduct Co. was registered eight years ago with an authorised capital of £15,000 in £5 ordinary shares and £1 preference shares. Three English shareholders hold 380 shares, and the balance of 1,435 shares was held by Germans. [According to a recent article in the *Evening News*, the total capital issued is £6,651, of which £5,232 is held by residents in Germany.] The managing director, Mr. W. Schmahl, is a naturalised German. This information was given by the English secretary of the company, whom the judge said seemed to have "fallen among Germans." In giving his judgment against the Armorduct Co., the judge said that the English Courts could not be used for the purpose of ministering sustenance to the enemy in matters of this description. The internal affairs of the Armorduct Co. showed that the profits would all go to Germany. The defendant, he added, had honestly discharged his obligation to this country. Leave to appeal was granted, it being stated by counsel for the Armorduct Company that, if the company could not collect its debts, 200 British workpeople would lose their employment.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**AUTOMATIC CIRCUIT-BREAKERS.**—A new illustrated pamphlet from the British Thomson-Houston Co. gives full illustrated particulars and prices of the Company's latest designs of automatic circuit-breakers for alternating and continuous currents with laminated edgewise main contacts, auxiliary copper and carbon breaking contacts, and free handle tripping device. The tripping mechanism is simple and strong, and can be actuated in a variety of ways, such as overloads, reverse current, low voltage, &c., with or without time limit arrangement. These breakers are listed up to 4,000 amperes in a number of forms; single, double, and triple pole; front or back connected.



**OZONE.**—A pamphlet from Ozonair, Ltd. (96 Victoria Street, S.W.), entitled, "All About Ozonair," gives an interesting survey of the properties and production of Ozone, and its commercial applications for air purification as embodied in the Ozonair system of ventilation, for deodorisation, in therapeutics, for water purification, sewage treatment, and food preservation, as well as in the brewing, bleaching, chemical, textile, and other industries.

**WATER STERILISATION.**—A complete apparatus for sterilising water by the action of ultra-violet rays produced by quartz mercury vapour lamps is described in a leaflet from the Westinghouse Cooper Hewitt Co., Ltd. (80 York Road, King's Cross, N.). The equipment, which is made in several sizes up to 130 gallons per hour, is suitable for domestic or hospital purposes.

**METAL FILAMENT LAMPS.**—A very effective showcard, issued by the Edison & Swan United Electric Light Co., Ltd. (Ponders End), decorated with Union Jacks, and entitled "Keep the Flag Flying," calls attention to the British origin of Royal Ediswan Lamps.

**HEATERS.**—An illustrated pamphlet from the British Thomson-Houston Co., Ltd. (Rugby) deals with several patterns of heaters. These include a number of designs of radiant "fires" with glowing wire elements as well as non-luminous convectors suitable for a variety of conditions.

**STORAGE BATTERIES.**—The latest pattern of "Ironclad Exide" battery, which is now largely used for electric vehicle work, is described in an illustrated pamphlet from the Chloride Electrical Storage Co., Ltd. (Clifton Junction, Manchester).

**LAMPS.**—An effective "poster stamp," repeating in miniature their well-known Union Jack Mazda advertisement, has been prepared by the British Thomson-Houston Co., for issue in quantities to contractors.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Ashton-under-Lyne.**—A report is being prepared dealing with extensions at the generating station.

**Blackpool.**—H. and L.T. cable, distribution pillars, and conduit. Borough Electrical Engineer.

Water-tube boiler, mechanical stokers, 1,500-kw. alternator, &c. Borough Electrical Engineer. Nov. 19th. (See an advertisement on another page.)

**Connah's Quay.**—Complete generating equipment, including gas engines, generators, battery, mains, services, public lighting, &c. Consulting Engineers, A. J. Leigh & Partners, Bank Chambers, Northwich. Nov. 6th.

**Heywood.**—Converting plant. Borough Electrical Engineer.

**Ireland.**—The Great Northern Railway Co. of Ireland requires a twelve months' supply of electric cable and wire, electrical fittings, &c. Secretary, Nov. 5th.

**Keighley.**—Extensions to electricity works (£1,000).

**London: Hammersmith.**—H.T. and L.T. cables. Borough Electrical Engineer. Nov. 4th. (See an advertisement on another page.)

**Pontypridd.**—1,800 yards of 0.4 concentric paper-insulated and lead-covered cable. Borough Electrical Engineer. Oct. 20th.

**Tunbridge Wells.**—H. and L.T. cables. Borough Electrical Engineer. Nov. 7th.

**Turton.**—Extensions at power station (£3,815).

**Waterford.**—The electric lighting scheme, at an estimated cost of £30,000, is to be proceeded with.

### Wiring

**Cardiff.**—Wiring and fitting of County police station. Clerk, County Council. Oct. 26th.

**London: L.C.C.**—235 wiring points with 290 lights at Senior St. Elementary School, Paddington. (See an advertisement on another page.)

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Altrincham.**—Extensions to Stamford Park school (£2,000).

**Bradford.**—New infirmary (£100,000).

**Coatbridge.**—Extensions to Technical School and Mining College (£7,000).

**Hull.**—Housing scheme (£100,000).

**Ipswich.**—Hospital, Foxhall Heath. Borough Engineer.

**Leicester.**—Extensions at North Evington Infirmary (£20,000).

**Leigh (Lancs.).**—Additions to workhouse (£9,000).

**Manchester.**—Carnegie Library, Didsbury. City Architect. October 16th.

**Nottingham.**—Four new branch libraries.

**Rawtenstall.**—New Post Office, and telephone exchange.

**Sal.**—School (£5,000).

### Miscellaneous

**Birmingham.**—Tramway extensions (£111,240).

**Dublin.**—The Dublin United Tramways Co. requires a twelve months' supply of electrical stores. Chairman, Nov. 9th. (See advertisement on another page.)

**Swinton and Pendlebury.**—Street-lighting equipment. Borough Electrical Engineer.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Chesterfield.**—The following tenders have been placed:—British Westinghouse Co., for a 1,500-kw. rotary-converter and transformer, with switchgear, at £2,200, and a 1,200-kw. transformer and switchgear at £282; British Insulated & Helsby Cables, for high-tension cable at £725.

**Eccles.**—The tender of Messrs. E. Bennis & Co. has been accepted for a coal elevator and conveyor.

**Gillingham.**—A contract has been placed with the British Electric Transformer Co. for five transformers, subject to inquiries to ascertain whether the Company is a purely British concern.

**London: St. Pancras.**—The tender of Medway's Safety Lift Co. for an electro-oil lift at the King's Road Station has been accepted at £1,169 plus £200 for a spare motor-driven oil pump.—A tender of the British Niclausse Boiler Co. was recently accepted for four boilers at the King's Road Generating Station at £20,200; a difficulty has now arisen as to the steel supporting work of the chimneys for the boilers. The Company state that this was not included in their quotation, and informs the Chief Electrical Engineer that they will not go on with the contract unless the cost of this steelwork, viz., £700, was added. The Committee recommends that the Company's suggestion be adopted.

**Salford.**—The tender of Messrs. Willans & Robinson for a 5,000-kw. turbo-alternator with surface-condensing plant.

## APPOINTMENTS AND PERSONAL NOTES

We regret to announce the death, from gastritis, of Mr. Gordon Stuart, the popular Secretary of the Stearn Electric Lamp Co., Ltd. Mr. Stuart is succeeded by Mr. H. W. Cole, who has acted as Mr. Stuart's Chief Assistant for many years.

The Gillingham Electricity Department requires a shift engineer. Salary 32s. 6d. rising to 40s. per week. Applications to Borough Electrical Engineer.

A testing assistant is required in the York Corporation Electricity Department. Applications to City Electrical Engineer.

Mr. W. T. Le Feuvre, Borough Electrical Engineer at Bexhill, having applied for a Commission in the Army, the Council has decided to keep his post open, and to pay his family £225 per annum, retaining the remaining £200 per annum for the payment to the Assistant Engineer of an additional £100 per annum, the balance to meet any further engineering assistance that may be required.

The following is the short list of applicants for the position of Generating Engineer at the Hackney Electricity Works. Commencing salary, £120 rising by annual increments of £7 10s. to £150: H. Kraseman, Assistant Charge Engineer, Hackney; F. D. Osborn, Assistant Shift Engineer, Hackney; and D. H. Rogers, Assistant Shift Engineer, Hackney.

## LOCAL NOTES

**Bury St. Edmunds: Arc Lamp Carbons.**—A further reduction in the hours of lighting the public arcs has been decided upon, as the stock of carbons under ordinary conditions would only last twelve weeks, and the Electrical Engineer reports that he can only obtain further supplies at exorbitant prices. Meanwhile, consideration is to be given to the substitution of arc lamps by high candle-power metal-filament lamps.

**Carshalton: Bulk Supply.**—The Council has decided to withdraw its objection to the proposal of the County of London Electric Supply Co. to give a supply of electricity in bulk to the South Metropolitan Electric Tramways and Lighting Co.

**Edinburgh: Street Lighting Charges.**—With reference to the note in our last issue concerning the reduction in the hours of burning public arc lamps, it has now been arranged that in view of this reduction the rate for all-night lamps shall be increased to £9 16s. 8d., and for half-night lamps to £5 3s. 8d.

**Hessle: Electric Supply.**—Various schemes for giving a supply of electricity in the Hessle district have been under consideration for several years, but none have yet been carried out. The intention of the Council has been to obtain a supply from one of the neighbouring towns, and it has now been decided that the Hull Corporation shall apply for an electric lighting Provisional Order.

**Leeds: Management of Electricity Undertaking.**—The question of appointing a special committee to deal with the electricity undertaking, instead of both this and the Tramways Department being under one Committee, as at present, was raised at the last meeting of the Corporation. It was decided, however, to leave the matter over for the new Council, which will be appointed in November, to deal with. There has been a growing feeling of late that the management of the Electricity Department should be reconsidered.

**London: Hackney: Lamp Trimmer Killed at Front.**—The Electricity Committee recommends that a sum of £10 be paid to the widow of J. Singer, late arc-lamp trimmer in the Department, who was drowned in the disaster to *H.M.S. Hogue* in the North Sea. In addition, £4 13s. 11d. is to be paid to the workman's widow, this being the amount he had paid in the Superannuation Fund.

**Maidstone: Engineer's Bonus.**—According to the *Kent Messenger*, the Council has decided to ask the Electrical Engineer to refund any bonus received by him for the past year in excess of the £500 limit fixed in 1910. In that year it was arranged that Mr. Hoadley's salary should be £300 per annum, plus a bonus on a certain scale, the total not to exceed £500. Apparently, however, Mr. Hoadley was paid a total salary of £700 in the year 1913-14.

**Oldham: Electric Supply Extension.**—In response to requests from the Lees and Springhead Councils for a supply of electricity, the Electricity Committee is to meet a deputation with a view to endeavouring to arrange terms.

**Pickering: Electric Light Scheme Postponed.**—The promoters of the local electric lighting Order have asked the Council to leave unsigned, for the present, the proposed agreement. The reason for this request is the unsettled condition of the money market; but it is anticipated that a scheme will be submitted in about six months' time.

**Walsall: Supply of Electrical Fittings.**—The Electricity Committee has decided to open a showroom in order to supply electrical fittings to the public.

MISCELLANEOUS BUSINESS NOTES AND  
TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, the following may be taken as the official quotation for electrolytic copper bars, viz., £52 10s. to £53. (Last week, £55 to £55 10s.)

**Companies Struck Off Register.**—The names of the following will be struck off the register of joint stock companies in three months unless cause is shown to the contrary:—Bishop's Stortford and Stansted Electric Lighting Co., Ltd.; British Electric Light Wiring Co., Ltd.; British Ever-Ready Electrical Co., Ltd.

COMPANIES' DIVIDENDS, REPORTS,  
MEETINGS, &c.

**Drake & Gorham.**—Including the sum of £1,716 brought forward from the previous year, there is a sum available for the year to June 30th, 1914, of £9,931. A 4 per cent. dividend is recommended, goodwill is written down by £3,000, and a balance of £1,931 carried forward. The directors have not deferred the payment of dividends, as they appreciate the necessity for maintaining the circulation of money. Mr. B. M. Drake presided at the annual meeting last week. He pointed out that although the net profit is somewhat lower than last year, it is practically the same as the average for the past three years. The difference is caused by additional expenditure upon advertisements, including catalogues, and partly to a decreasing turnover in the North due, doubtless, to the condition of the cotton trade. The Company has acquired a sole agency for Lancashire and Cheshire, and a general agency elsewhere for commercial vehicles propelled by Edison batteries.

**Dick, Kerr & Co.**—The net profit for the year to June 30th was £44,761, compared with £30,092 in the previous twelve months. Adding the balance brought forward, the available total is £55,086. After meeting debenture interest and preference dividend, the balance is £25,525, which it is recommended should be carried forward. The directors do not propose any dividend on the ordinary shares in view of possible contingencies resulting from the war. It is also proposed to utilise the reserve of £150,000 to adjust the values of investments and assets generally, and the necessity for more working capital (to meet the increase in business indicated owing to diminution of German competition) requires an issue of debentures.

At the annual meeting on Thursday, Mr. Claud T. Cayley, the Chairman, expressed the opinion that however Germany might be crippled financially for the time being by the war, she would make stupendous efforts to regain her lost markets.



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# ELECTRICAL ENGINEERING

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(Established 1884)

No. 409 [VOL. X., No. 44]  
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THURSDAY, OCTOBER 29, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

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Telegrams: "Circling, Fleet, London."

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Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

WE report an action in the Chancery Division relating to an alleged infringement of a patent for a conduit grip fitting (p. 560).

ALTHOUGH Canada has hitherto imported considerable quantities of bulbs and complete metal filament lamps from Germany, a certain number of lamps are manufactured there and no shortage is expected (p. 560).

AN article on the carbon industry appears on p. 560.

SOME remarkable figures for steam consumption have been obtained on tests of a 1,000 kw. Ljungström steam turbine at St. Pancras (p. 561).

THIRTY-EIGHT 750-watt half-watt lamps have been fixed in Oxford Street, Manchester (p. 561).

THE relative advantages of lap and wave armature windings are discussed in our "Questions and Answers" columns (p. 562).

THE new edition of "Lektrik Lighting Connections" is reviewed (p. 563).

FAULTS upon tramcar magnetic brakes are referred to.—The Brighton Corporation refuses to adopt the over-running type of trolley omnibus favoured by Hove (p. 563).

THE equipment of an American wireless station able to communicate with Germany is described (p. 563).

Two patent specifications by C. O. Bastian for mounting heater resistances and drawn wire helical lamp filaments were published last Thursday. Other interesting specifications include a system of opening accumulator charging circuits automatically on full charge and improvements in lampholders, switches,

and hooters. Among the patents expiring this week, after a full life of fourteen years, are the Mansbridge condenser patent, one of the B.T.-H. Co.'s multiple unit control patents, and a patent in connection with the Lorrain surface contact system (p. 564).

AN interesting system of automatic motor control and a new high-tension fuse are described in our Trade Section, which also calls attention to new wall plugs and adapters, new fittings for half-watt lamps, and a system of shop window lighting (pp. 564 to 566).

AN expenditure of £25,000 on plant and mains is contemplated at Southport; mains are required at Hastings; new generating plant by Melbourne and River Plate Electric Supply Co.; hand lamps by H.M. Office of Works; and a works is to be equipped electrically at Oldham (p. 567).

THE Bradford contract for the 5,000 kw. Bergmann turbo-alternators is referred to.—Considerable objection is shown in Croydon to the L.C.C. power scheme.—The Basingstoke Diesel engine power station has been opened (p. 568).

## THE INSTITUTION 1914-15 SESSION

AS already announced, the Institution of Electrical Engineers will open its 1914-15 Session to-day (Thursday), when the President, Sir John Snell, will deliver his Inaugural Address. The papers which are to be read during the first part of the session were announced in our last issue. At the opening meeting of the Manchester Section at the Engineers' Club on Tuesday, Mr. P. P. Wheelwright, who was elected Chairman on the resignation of Dr. Rosenberg, will deliver his address. On Nov. 17th, Dec. 1st, and Dec. 15th, the papers to be read in London by Mr. Beaver on "Cables," Mr. Selvey on "Power Plant Testing," and Mr. Wedmore on "Automatic Protective Switchgear for Alternating Current Systems," on Nov. 12th and 26th, and Dec. 10th, respectively, will be taken. On Jan. 12th, 1915, Prof. E. W. Marchant will read a paper on "Conditions affecting the Variation in Strength of Wireless Signals," and on Jan. 26th a paper on "Electric Furnaces" will be given by Mr. T. D. Robertson. Papers on the following subjects will be read later:—"Some Difficulties of High-speed Generator Design," "The Predetermination of the Performance of Dynamo-electric Machines," "Illumination," "Frequency Changes," "Training for the Industrial Side of Engineering."

The arrangements for the Yorkshire Section only go as far as the first half of the Session. The Chairman, Mr. T. Roles (Chief Electrical Engineer, Bradford), will deliver his Address on Nov. 4th, and on Dec. 2nd and Jan. 13th the papers by Mr. Selvey and Mr. Wedmore, respectively, will be taken.

For the Scottish Section, the full programme has been arranged. On Nov. 10th the Chairman, Mr. James Lowson, will deliver his Address, and the following papers are down for consideration:—Dec. 8th, "The Magnetisation of Iron at High Flux Density with Alternating Currents," by J. S. Nicholson; Jan. 12th, Mr. Beaver's paper; Feb. 9th, "Distribution and Rise of Temperature in Field Coils," by Prof. Magnus Maclean, D. J. M'Kellar, and R. S. Begg; March 9th, Mr. Wedmore's paper; April 13th, Mr. Selvey's paper. The Students' Section will not hold any meetings this Session.

The Western Section has decided to hold no meetings during the 1914-15 Session.

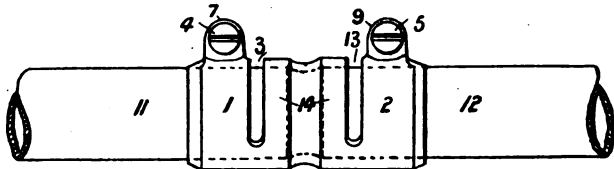
For "Arrangements for the Week," see page 568.



## A GRIP CONDUIT FITTING PATENT ACTION

IN the Chancery Division on Friday of last week and Monday of this week, Mr. Justice Joyce heard an action for alleged infringement of Patent No. 18,375/05, which relates to a grip conduit fitting. The patent is owned by the Walsall Hardware Manufacturing Co., and the defendants were the Stella Conduit Co., Ltd., of Bilston, Staffs. Mr. A. J. Walter, K.C., Mr. H. A. Colefax, K.C., and Sir Denham Warmington appeared for the defendants, whilst the Stella Conduit Co. was represented by Mr. T. Terrell, K.C., and Mr. A. Grey.

The illustration below, reproduced from the patent specification in question, shows a conduit coupling with a longitudinal split, at the end of which is a cross cut, in order to allow of elasticity in the coupling, there being also lugs as a means of tightening the couplings on to tubes. The defendants admitted that they manufacture their conduit fittings exactly in accordance with the patent, but alleged that there was no subject-matter for the invention. The main point relied upon by them was that a coupling with a longitudinal split and cross cut, with lugs for tightening as a means of holding tubes together has been in use in connection with the "heads" of bicycles from the very earliest days, and that all that had



been done under the patent was to apply such a means of fastening to various forms of bends, T-pieces, sockets, &c., in order to enable a perfect grip to be obtained of tubes used as electrical conduits.

On the other hand, Mr. Walter, whilst admitting, after the case had proceeded a little while, that the patentee had adopted the familiar bicycle head coupling as the basis of his invention, urged that the fact that he had applied it at two ends of a coupling, instead of only at one, as in the case of a bicycle, constituted invention. In addition to this, he argued that the main object of the invention was to secure electrical continuity, and that this had been achieved was admitted by the defendants in their catalogue, which referred to this form of grip fitting as the best, most reliable, and cheapest form of grip fitting on the market from the point of view of electrical continuity. He did not suggest that the patent invented a new form of pipe grip, but argued that it was a patent of selection in the sense that a form of grip had been selected as the best for the purpose, and dealt with in such a manner that a combination was obtained giving a result which the separate parts did not give before.

Mr. James Swinburne, F.R.S., gave expert evidence for the patentees, and Mr. E. C. R. Marks (Messrs. Marks and Clerk) and Mr. N. Rosher, of Messrs. Moffet and Rosher, were the chief witnesses for the defendants.

Judgment was reserved.

## THE LAMP SITUATION IN CANADA

AN article in the (Canadian) *Electrical News* reviews the effect of the war on incandescent lamp supply in Canada, and to some extent North America, generally, and states that the danger of shortage appears remote. It seems, however, that up to now lamp manufacturers of North America have, like ourselves, relied largely on Germany and Austria for bulbs, although at least one lamp factory in the United States already blows practically all its own bulbs, and the practice is increasing. The lamp caps have hitherto chiefly come from Holland, as is the case here. A large percentage of the metal-filament lamps used in Canada have been, and are still, coming from England and Holland, and there is no likelihood of any marked increase in price. A prominent Canadian manufacturer states that, after difficulties in starting his own bulb blowing, he has been buying bulbs from the United States at a higher price than charged for foreign bulbs. Supplies of tungsten are plentiful, and he does his own refining and wire drawing. This particular work is being much increased to meet the demand for lamps to replace those formerly imported. Some statistics are given showing that the values of metallic elements and tungsten acid imported by Canadian manufacturers for use in their own factories for making metal-filaments for the year ended March, 1914, was £350 from Austria-Hungary, £6 from Great Britain, and £883 from the United States. The figures given for

imported glass include glass used in the gas-lamp industry. The number of complete lamps imported from Germany alone was 502,533 metal-filament lamps, 296,535 carbon lamps, and 164 arc lamps. It is also of interest to give the following values of Canadian imports of arc-lamp carbons during the same period:—Austria-Hungary, £117; Belgium, £44; France, £127; Germany, £8,662; Switzerland, £498; Great Britain, £1,049; United States, £7,743.

## THE CARBON INDUSTRY

THE last leaflet which the Commercial Intelligence Department of the Board of Trade has issued in the series relating to the competition of Germany and Austria in neutral markets, deals with carbons for electric lighting, &c. Apparently the Board of Trade has not realised that conditions were prevailing which enabled Germany and Austria to supply carbons for the British market at prices far lower than those at which they could be manufactured here with profit. As the carbon manufacturers fear that these conditions may prevail again, or, at all events, in a form only modified to a certain extent after the war, there is a decided disinclination to make large extensions of carbon works on a permanent basis in this country, or to establish new ones.

As already mentioned in our issue of Aug. 13th, nearly £500,000 worth of carbons were exported from Germany during 1913, over one-sixth of which was sold in Great Britain. From Austria-Hungary £48,000 worth were exported, of which, however, £21,500 worth were sent to Germany, leaving £26,500 exported to other countries, of which £9,200 went to Great Britain. So long as it is still impossible to manufacture in this country sufficient carbons for our own needs, it does not seem likely that we shall start competing in foreign markets, unless, on further examination, the manufacturers here come to the conclusion that the increased production will put them in a position to compete with Germany for the export trade after the war is over. If the Board of Trade—possibly in conjunction with the Home Office—were to institute a detailed analysis of the reason for carbon manufacture being so much dearer here than abroad, and to suggest remedies, some useful result might be obtained.

We hear that the Silvertown Co. and Siemens Bros. & Co. are already starting the resumption of carbon manufacture which was abandoned by them years ago, and it will be interesting to see how their products and prices compare with those to which we have been accustomed in recent years. It is also rumoured that another small and independent carbon factory is being started. We welcome this activity and trust that it will assist to improve the position.

**Continental Trading Methods.**—During a discussion at the Institution of Automobile Engineers on the 14th inst., upon the steps to be taken to wrest from Germany the important share that country has acquired in the automobile industry. Mr. G. H. Baillie, a one-time partner of Mr. James Swinburne, F.R.S., mentioned that he worked in Italy on electrical work for five years. When he went there he knew a fair amount about English electrical plant, but he knew nothing about German or Swiss. Consequently he had every reason, and certainly always wished to use English plant, but the whole time he was there—and he bought a great deal of plant—he found it impracticable to buy British plant. Everything came from Switzerland or Germany. The reason was that the English seller, at any rate for comparatively small orders, would not give any facilities at all to a purchaser. It was quite impossible to get a single quotation except f.o.b. London, and in one case the cost of shipping and customs amounted to about 60 per cent. of the value of the goods. Any Swiss or German firm would generally quote free at the local station, without even being asked, or at any rate would quote at the frontier station where it was easy to ascertain the charges. No English firm also would supply except with cash against bill of lading, i.e., against cash a long time before the customer got the goods. In every case a German or Swiss firm offered very good credit terms. The English manufacturer's excuse was that the risk was too great to give credit. Nevertheless the German and Swiss firms took the risks, and also precautions against them. On these points, concluded Mr. Baillie, English manufacturers will have to mend their ways if they want to capture from the Germans the business which it is now hoped to acquire from them.

**B.E.A.M.A. Annual Dinner.**—The Council of the British Electrical and Allied Manufacturers' Association decided at the last meeting not to hold the usual annual dinner this session.

## STEAM CONSUMPTION TESTS OF A LJUNGSTRÖM TURBINE

SOME very satisfactory figures of steam consumptions which have been obtained from tests of the 1,000 kw. Ljungström steam turbo-alternator recently installed by the Brush Electrical Engineering Co. at the St. Pancras Electricity Works are given in a report by Mr. S. W. Baynes, Chief Electrical Engineer to the St. Pancras Borough Council. The set was put into commission on July 30th, and over the period of its operation has generated near a million units. The steam consumptions realised on test were considerably better than those guaranteed as is shown by the figures given below:—

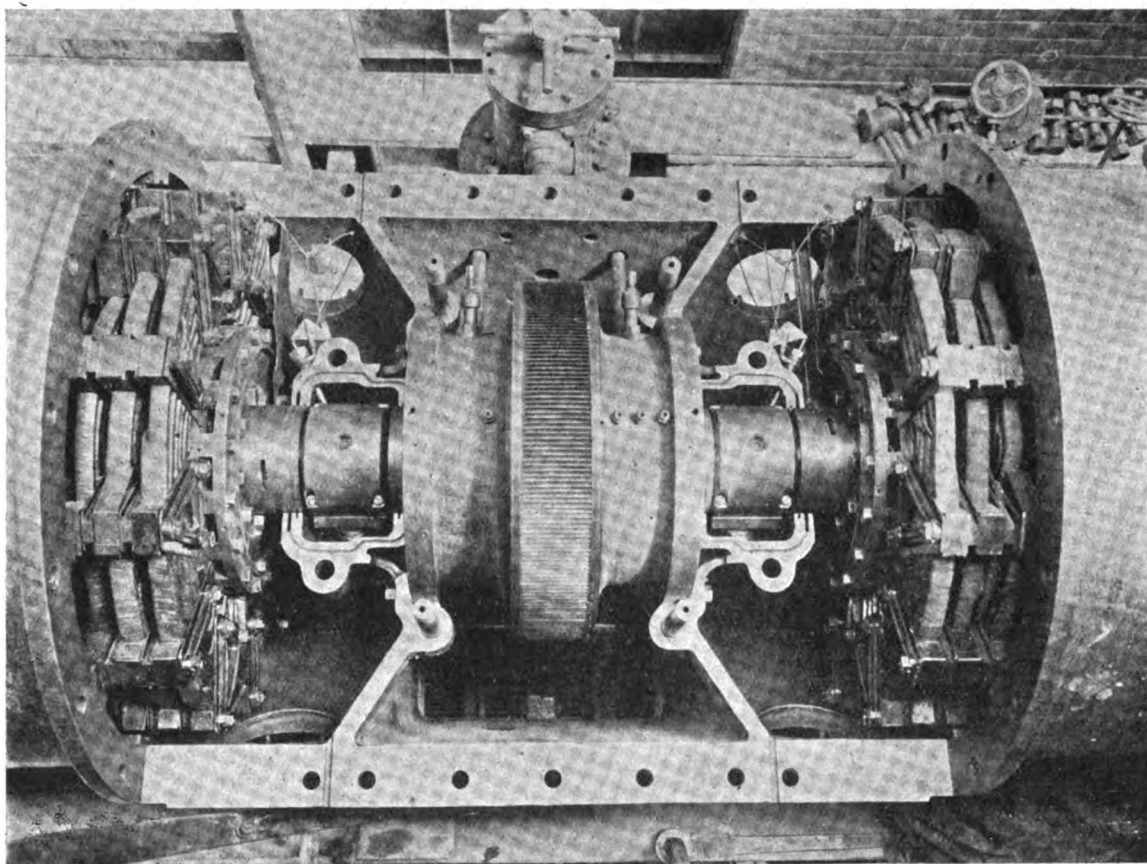
Steam consumption in lbs. per kw.	Full Load.	$\frac{2}{3}$ Load.	$\frac{1}{2}$ Load.	$\frac{1}{4}$ Load.
Actual ... ..	12.75	13.57	14.67	17.76
Guaranteed ... ..	14.0	14.75	16.5	19.75

Mr. Baynes' report continues as follows:—

Since this turbine has been in use there is a saving in coal equivalent to about £1,700 per annum, a result

the 12.75 of the Ljungström set mentioned above, while 11.8 lbs. per kw. hour is guaranteed for the 5,000 which is to be installed, and it is hoped that this will be improved upon when the tests come to be made. The improvement to the fractional loads is even more remarkable.

The Ljungström turbine was developed by the brothers B. and F. Ljungström of Stockholm and is in principle a reaction machine, although differing in construction radically from any other design. Briefly, it is a radial-flow machine, in which the steam is admitted between two discs, and in its passage it passes between concentric blading rings, carried alternately by the two discs. The two discs revolve in opposite directions, and to the shaft of each is attached a generator. Notwithstanding the fact that two generators are employed, however, the complete set is extraordinarily compact for its output. There is no blading carried on split cast-iron casings, for it is all mounted on the concentric rings. This construction avoids risk of distortion when high superheats are adopted. The turbine is supported principally on the lower part of its casing, forming its exhaust branch, and can be mounted direct on the condenser without requiring separate foundations. The steam is led in by pipes within



VIEW LOOKING DOWN UPON TURBINE WITH UPPER HALF OF CASE AND DIFFUSER REMOVED.

which amply justifies the trouble and small expense of the early investigations into its merits. Notwithstanding the high speed of 3,000 revolutions per minute and 6,000 per minute between the two rotating elements there is almost complete absence of noise or vibration, and the control, both electrically and mechanically, is all that could be desired. It is, indeed, the quietest and smoothest running set ever placed in the works.

The report concludes with some interesting figures showing the progressive improvement in steam consumption there has been with the various types of plant installed in the station since its inception in 1891. Thus, while the full load consumption of the reciprocating plant improved from 26.6 to 19.5 lbs. per kw. on full load, the first kw. D.C. turbo-generator in 1906 gave a figure of 17.0 which was lowered to 16.15 by the 2,200 kw. turbo-alternator of 1909. Now we have

the lower part of the casing to chambers on either side of the discs, whence it passes through holes in them to the central annular space within the discs. It then passes radially through the gradually widening blading, leaving through a diffuser of multicellular construction and similarly widening channels and passing into the surrounding exhaust space. Labyrinth packing is provided at the shafts and between the revolving discs and the side discs, and the constructional details are of remarkable ingenuity, especially as regards the building up to the cages of blades, and their flexible attachment at alternate ends to the revolving discs. The most complete precautions have been adopted to avoid distortion from temperature effects. An idea of the relative proportions of a complete 1,000-kw. Brush-Ljungström turbo-generator will be obtained from the photograph reproduced in the figure. Summing up the general features, it may be said that the great economy obtained is due to the high relative blade speed, the small internal leakage, and the care taken to minimise radiation and other losses.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,414.

What are the relative advantages and disadvantages of using tin as against solder for the joints of high-speed (turbo driven) direct-current armatures? What is the "life" of such a joint, and how does it eventually fail? What are the usual precautions to ensure that "fatigue" of these joints does not occur from the stress reversal and temperature effects? Has any form of welded joint been used, and is this found to be successful?—"E. P. H."

(Replies must be received not later than first post Thursday, Nov. 5th.)

### ANSWERS TO No. 1,413.

In what circumstances is it preferable to employ a wave winding rather than a lap winding for the armature of a four-pole motor?

The first award (10s.) is made to "KOIL" for the following reply:—

In direct-current armatures the number of bars equals

$$\left( \frac{\text{Back e.m.f. (volts)} \times 10^4}{\text{Armature flux per pair of poles} \times \text{revs. per min.} \times K} \right)$$

where  $K$  = the number of poles divided by the number of parallel paths, i.e., 1 for all lap-wound armatures and 2 for four-pole wave-wound armatures. Thus, other things being equal, the bars in a wave armature are to those in a lap armature as 1 is to 2. The number of bars obtained with high-voltage lap-wound four-pole machines necessitates either a large number of commutator segments or numerous turns per coil. The former of these is often impracticable, owing to mechanical considerations, and the latter is undesirable, owing to the increase in reactance voltage. This voltage is proportional to the armature current per path and to the (turns per coil)<sup>2</sup>. Although with lap winding the current per path is only one quarter of the total armature current, the reactance is approximately twice as great as in a wave-wound armature with half the turns per coil, in spite of the current per path in this case being 50 per cent. of the total armature current. Thus it is always desirable to adopt wave-windings for machines above 400 volts, and more often than not above 200 volts. On lower voltages, if a single turn lap-winding gives a suitable number of commutator segments, it can be used with advantage; but, providing the sparking criteria are satisfactory, the following further considerations might still warrant a wave-winding, provided, of course, the number of commutator parts obtained with it are not too few. Lap-wound armatures must always be very carefully set in their magnets to ensure as far as possible equal magnetic loading per pole. Even then inequalities of the steel or iron of the magnet, wearing of the bearings, &c., may disturb the equilibrium and cause circulating currents to set up within the armature. Equalising connections can, of course, be fitted to overcome this trouble, but the expense and difficulty of fitting them is hardly ever warranted in small four-pole machines. Wave windings do not suffer from this trouble, and with them

the same accuracy of setting, &c., are not necessary. Again, other things being satisfactory, only two sets of brushes need be used on wave-wound armatures with consequent reduction in manufacturing costs, &c., whereas a lap-wound armature must always have as many sets of brushes as there are poles. This point is of great importance in motors for use in confined positions, such as on tramcars, where it is often most difficult to get at brushes on the lower side of the commutator for inspection, &c. To sum up, wave-windings should be used on all four-pole machines unless the number of commutator bars obtained by using them is too small.

The second award (5s.) is given to "ASTATIC," who writes as follows:—

It is preferable to employ a wave-winding to a lap-winding for armatures of four-pole motors in circumstances where the supply voltage is high (say up to 600 volts), and where, should a fault occur on the armature or brush gear, it is necessary to adopt temporary measures to get the motor running again pending a suitable time to repair the fault permanently. Lap-wound armatures do not meet these requirements in four-pole machines, and to explain this it is necessary to describe briefly the circuits in lap- and wave-wound armatures respectively. All lap-wound armatures must have the same number of brush bars as there are poles in the field magnets; thus with a four-pole motor there will be four brush bars, and a six-pole motor will have six brush bars, and so on, each alternate brush bar being connected together with a copper strip. From this it will be seen that there are four paths in parallel for the armature current; therefore, if the armature under full load takes 400 amperes, then there will be 100 amperes in each path. Wave-wound armatures have a two-circuit winding, and the two circuits are in parallel. This winding is the same for all armatures, irrespective of the number of poles in the field magnets, and in the case of the four-pole motor under discussion two or four brush bars may be used. This gives a wave-wound armature a decided advantage over an armature that is lap-wound. As an example, we will suppose that four brush bars are being used and a bar insulator breaks down to earth (this is a frequent occurrence where high voltages are used); it is only necessary to remove the faulty insulator; the motor may then be started, and it will run satisfactorily with the three remaining brush bars. This cannot be done with lap-wound armatures, because if one brush bar is removed, two sections of the armature are cut out, or, at least, two sections are short-circuited by the copper link which connects two of the remaining brushes, with the result that only half of the armature coils are energised, and considerable sparking will take place at the remaining brushes. Again, we will suppose that a break occurs in a coil of a wave-wound armature. This will be apparent by considerable sparking, as the segment of the commutator connected to the faulty coil passes under the brushes. In this case it is only necessary to join the segment of the defective coil to the adjacent segment by soldering or slightly caulking them together on the edge of the commutator. This will not interfere with the brushes as the armature rotates, and the motor will run without sparking. In lap-wound armatures the segments could not be joined together with satisfactory results, because the current would be increased in the short-circuited segments, the armature magnetism would be uneven, and the commutator would commence to be troublesome. From the foregoing it may be said that wave-wound armatures are suitable for high voltages, and lap-wound armatures are more suitable for low voltages.

### ELECTRIC VEHICLES

AT a recent meeting of the Electric Vehicle Committee the final design of a standard sign for charging stations was approved, and a sample of the standard charging plug made by A. Reyrolle & Co. (see *ELECTRICAL ENGINEERING*, Sept. 24th, p. 516) was approved. Some slight alterations were made in the wording of the specification of this plug to make it clear that the handle can be of malleable cast-iron, and to give the option of making the outer shell of galvanised steel or bronze tubing. The Committee had already fixed the standard range of charging voltage as from 85 to 120, and it was decided to make it clear that this voltage is suitable for forty-four lead cells as a maximum. Other matters discussed included alarm signals for electric vehicles, and it was decided to allow the use of electric horns as well as gongs. Mr. P. Still (Engineer and Manager, Chelsea Electric Supply Co.) has been invited to become a member of the Committee.

## HALF-WATT STREET LIGHTING IN MANCHESTER

IT is interesting to note that the Manchester Corporation have erected thirty-eight half-watt lamps in Oxford Street, between All Saints' and Whitworth Street. Both lamps and fittings have been supplied by the General Electric Co. The lamps are fixed opposite each other on the tramway standards, and the distance between them varies from 90 ft. to 100 ft. Current is supplied from bare overhead distributing wires, erected in accordance with the Board of Trade regulations, and with the approval of the Post Office. The lighting gives great satisfaction in Manchester, and it is proposed to extend the system of lighting from All Saints' down Oxford Road and Wilmslow Road to Fallowfield; but the high standard of illumination will not be adhered to throughout the distance. Probably, instead of one lamp being fixed on each tramway standard, as in Oxford Street, the lamps will be "staggered" for the remainder of the route.

## ELECTRIC LIGHT SWITCHING

THE third edition (twenty-fifth thousand) of "Lektrik Lighting Connections," by Mr. W. Perren Maycock, which has just been published, contains descriptions and diagrams of no less than 105 circuits, as compared with sixty-eight of the previous edition. It is surprising to see the large number of types of switches and methods of connecting them for different purposes; but careful classification and indexing and good illustrations prevent the reader from bewilderment. The book, which is of pocket size, is issued by Messrs. A. P. Lundberg & Sons, at the modest price of 6d. (post free, 7d.),\* and every consulting electrical engineer, contractor, foreman, and wireman will find it useful to have a copy. Every conceivable arrangement of switches appears to be dealt with. For those to whom it is difficult even to carry the simple connections of an ordinary two-way switching circuit in their heads, the book will be invaluable; but it should appeal to a wider circle than this. It may not be often, for instance, that one desires to wire a circuit so that all or part of a group of lamps may be switched on or off at any one of three different points; but when such problems as these do arise it is convenient to be able to turn up in a book the exact type of switch required and the wiring diagram, instead of sitting down to the problem and working it out.

In connection with this subject we may refer our readers to an advertisement on p. xi. of this issue, with regard to an electric light switching competition, particulars of which will be published in our next few issues.

\* Copies may be obtained from the Kluwert Publishing Co., Ltd., 203, Temple Chambers, E.C. Enclose seven penny stamps with order.

## ELECTRIC TRACTION NOTES

According to a British Consular report from Osaka, there are now 250 miles of double-track in operation within a radius of fifty miles, and a further eighty miles under construction. The greater part of this district seems to be suffering from the lack of means of communication, and but for stringency in the money market a number of other extensions would have been proceeded with.

With reference to the note on p. 528 of our issue of Oct. 1st, referring to the experiments with the over-running trolley system of trolley 'bus by the Hove Corporation, the Brighton Corporation has notified its disinclination to adopt this method. Unless the under-running trolley is adopted, the Brighton Corporation will ask the Board of Trade to appoint an arbitrator to settle the difference, in order to provide for through running, in accordance with the Act of 1912.

The Government has placed the contract for the construction of the Post Office tube railway with Messrs. John Mowlem & Co., Ltd. The work is to be put in hand immediately, in accordance with the promise given in August by the Postmaster-General, the object being to assist in preventing unemployment at the present time.

Towards the end of last year, the magnetic brake on a London County Council tramcar became inoperative, due to the insulation of a field cable being chafed on a terminal from the blow-out coil at the bottom of the controller. An electrical contact was consequently established, and the effect was to short-circuit the motor armatures, thus preventing current being generated for the magnetic brake. The design of the controller concerned was such that the magnetic

brakes are operative when one motor is cut out. As the result of a communication from the Board of Trade, the Councils of the Municipal Tramways Association and the Tramways and Light Railways Association appointed a Special Committee to report upon the matter. Inquiries and a conference with the makers of various controllers led the Committee to group the faults likely to arise from controllers as follows:—(1) Faults which are liable to occur due to faulty design in the older patterns of controllers; (2) Faults which have occurred in controllers of modern design, owing to the introduction of devices intended as extra precautions; (3) Faults due to lack of attention in the depôts. In the last issue of the *Journal of the Tramways and Light Railways Association* these faults are discussed in some detail. It is regarded as undesirable to introduce additional contacts for special devices, such as run-back preventers, sanding arrangements, &c., and the necessity for proper attention at the depôts is insisted upon.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A description is given in the *Electrical World* of the wireless telegraph station at Sayville, Long Island, which is of special interest as having been constructed to communicate direct with Nauen, and since the cutting of the German Atlantic cables is the only direct link of communication between America and Germany. It appears that a good deal of war news of a kind has been circulated in America purporting to have been received in this way, but there is much scepticism over there as to its genuineness. From the details given it is apparently technically possible for Nauen messages to be picked up by Sayville, and it is possibly more their nature than their origin which has led to their being discredited. The aerial is a twelve-wire umbrella radiating some 400 ft. from a 500-ft. steel tower, and a "counterpoise" or capacity net is provided by an elaborate system of radial wires on 15-ft. poles. The generating plant for sending consists of a 50-kw. motor-generator working in conjunction with a battery; a further motor-generator rated at 60 k.v.a. supplies single-phase current at 600 volts 500 cycles to a 60,000-volt transformer which is connected to a 0.044 mf. condenser of the glass Leyden jar type in five groups. The condensers discharge across a bank of eight quenching gap units with about fifty cooled plate gaps in series, and through the primary of the oscillation transformer. Inductively coupled to this coil is the aerial-to-ground circuit, in which high-frequency current of about 120 amperes is set up. The antenna resistance is given as something under 3 ohms at 3,000 miles wave-length, so that the antenna power is about 35 kw. and the over-all efficiency from the power transformer primary about 75 per cent. to 80 per cent. The transmitting apparatus is controlled by an operator in a distant sound-proof room, while certain adjustments are taken care of by a supervising engineer nearer to the apparatus. Transmission to Nauen has been accomplished experimentally at night, but has not been regularly carried on; but there the writer of the article in question believes that there would be less difficulty in receiving, as Nauen is a larger station and the receiving apparatus is of a character that could pick up messages of a strength and character that would render them difficult of detection by other American stations. This apparatus is said to contain telephone relays of a particularly sensitive pattern.

Marconi's Wireless Telegraph Co. announces the opening of high power stations at San Francisco and Honolulu.

The following answer to an examination question is quoted in the *Post Office Electrical Engineers' Journal*:—"Underground lines are laid in iron pipes, the ends of which are plugged up with solid gutta-percha to prevent the growth of vegetables." Another candidate uses for fault localisation, "the brass ring galvanometer. It is yellow. The galvanometer is connected to a battery and to the cable. The needle will immediately commence to revolve. The greater the number of revolutions the greater the distance of the fault."

The Brazilian Administration stated on the 20th inst. that code and cipher telegrams were not prohibited between Brazil and other American countries.—The Tunis office now only admits private telegrams written in plain English or French, and restrictions regarding telegraphy also now apply to Mossamedes, in the province of Angola.—The land-lines between Puerto Plata and San Domingo are restored, and traffic for Curaçao and Venezuela is transmitted under normal conditions.—The Fao route is down beyond Bassorah.



## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published Oct. 22nd, 1914

A full list of these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

22,023/13. **Heaters.** C. O. BASTIAN. Methods of mounting heating resistances by winding helically coiled wire on an insulating rod, employing a thread inside the wire helix to hold the convolutions in place while wrapping round the rod, but able to be withdrawn afterwards. One figure.

22,024/14. **Metal Filament Lamps.** C. O. BASTIAN. Methods of mounting helical drawn-wire filaments of incandescent lamps by making use of straight portions of the wire which are left at intervals in preparing the helix. Four figures.

22,348/13. **Accumulator Charging.** H. J. READ and W. J. BRANSOM. A system for interrupting the charging circuit when an accumulator battery is fully charged. An ampere-hour meter acting through an overbalance mechanism and relays trips the circuit breaker when a predetermined reading is attained. Five figures.

22,394/13. **A.C. Hooter.** D. K. MORRIS, MORRIS & LISTER, LTD., and J. L. CATEAUX. A diaphragm hooter in which a small transformer within the apparatus is provided with an auxiliary magnetic circuit which actuates the diaphragm, so that no additional magnet or solenoid is required in the secondary circuit. Four figures.

28,915/13. **Lamp-holders.** A. H. BRACKENSIECK. A water-tight lamp-holder for electric signs, &c., having a cylindrical body with a flange at the front end provided with two recesses to take rubber packing washers to fit either a high-tension or low-tension lamp bulb. Six figures.

8,456/14. **Switch and Fuse.** A. H. SHORT. A D.P. quick break switch with spring fly-off device and fuses carried on the actual switch arms, all arranged in a very compact flat form. Five figures.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Arc Lamps:** RAILING and ANGOLD, 27,582/13.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.H. Co. (*G.E. Co., U.S.A.*) [Resinous insulating materials] 22,544/13.

**Dynamos, Motors and Transformers:** COATES, MIRREY and A. REYROLLE & Co. [Transformers] 19,919/13; BYFORD and ROBINSON [Control of series motors] 21,623/13.

**Heating and Cooking:** BERRY [Water heating] 22,416/13.

**Storage Batteries:** HANCOCK and DAVID [Battery plates] 19,109/13; NAYLOR [Battery plates] 25,607/13; CLARK & HART ACCUMULATOR Co., LTD. [Cell boxes] 10,107/14.

**Telephony and Telegraphy:** MARCONI'S WIRELESS TELEGRAPH

Co. and VYVYAN [Connection of condensers] 21,672/13; WESTERN ELECTRIC Co., NASH and GRACE [Hand telephones] 22,406/13.

**Traction:** LINDON [Train stops] 23,898/13; BALLINGTON & SHAW [Train stops] 15,632/14.

**Miscellaneous:** JONES [Demagnetising switches for magnetic clutches, &c.] 24,688/13; BLENHEIM [Electric bells] 29,581/13; COOPER [Contact makers] 10,770/14.

The following Specifications are open to Inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, Motors, &c.:** RILEY [Motor control] 17,038/14; SOC. DES ETAB. L. BLERIOT [Driving lighting dynamos] 20,272/14.

**Meters:** LANDIS & GYR, LTD. [Prepayment] 20,458/14.

**Miscellaneous:** HERGENS [Medical apparatus] 20,279/14; BRUCK [Magnetic separators] 20,552/14.

### Amendment Allowed

1,578/14. **Railway Signalling.** L. N. SWAINSON. An amendment has been allowed adding the name of F. A. CORTEZ-LEIGH as one of the inventors. (This specification has not yet been published.)

### Restoration of Lapsed Patent

27,196/03. **C. E. HUNTER. Switches.** An order has been made restoring this patent, which had been allowed to lapse in 1911.

### Expiring and Expired Patents

The following Patents expire during the current week, after a *little* of fourteen years:—

19,451/00. **Condensers.** G. MANSEBRIDGE. Condensers consisting of two strips of paper, each coated on one side with metal wound together in a roll.

19,499/00. **Train Control.** B.T.-H. Co. (*F. E. Case, U.S.A.*). This specification describes a large number of individual features of a complete multiple unit system employing contactors, the control circuits of which are supplied from a secondary battery. There are 34 claims.

19,674/00. **Surface Contact System.** H. H. LAKE (*W. M. Brown, U.S.A.*). This specification describes the studs and other features of the Lorrain surface-contact system of tramway traction.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** B.T.H. Co. (*G.E. Co., U.S.A.*) [Current regulation] 14,701/08; H. LEITNER [Distribution system] 15,888/09.

**Incandescent Lamps:** W. HEINRICH [Metal filaments] 16,065/09; POPE'S ELECTRIC LAMP Co. (*Trenzen*) [Metal filament lamps] 16,076/09.

**Miscellaneous:** W. V. JACKSON, F. H. LLOYD, and S. W. SMITH [Electric rolling-mill drive] 15,040/04.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### AUTOMATIC MOTOR CONTROL

WE have recently had the opportunity of inspecting the working of a system of motor control having some interesting features which is being introduced to this country by Mr. H. R. Canfield, and is being demonstrated at the premises of Messrs. Marryat & Place (28 Hatton Garden). The system, which, although new to this country, has been largely adopted in America, has for its principal feature the special form of relay switch shown in section in Fig. 2. The contact plate *G* is supported by a non-magnetic spindle from the main armature cylinder *E*, free to move up and down within the solenoid *I*. The non-magnetic upper spindle passes through a collar, *B*, of magnetic material, and the lower end of the armature or plunger is of reduced section, and passes through the lower magnetic collar *C*. We have thus, between *B* and *E*, the equivalent of an air-gap to the magnetic circuit formed by the core, the outer case, &c., while where the plunger narrows at the lower part we have,

so to speak, an air-gap in parallel with the central magnetic path. The consequence of this construction is that the flux produced by currents from a small value upwards acting through the upper air-gap pull the plunger up or close the switch. As higher and higher currents are applied, however, and the iron is on a higher part of its magnetisation curve, the proportion of flux passing through the air and the iron in the lower gap is altered, and when a certain critical value is reached the pull exerted here counterbalances that which can be exerted at the upper air-gap, and the plunger is prevented from rising. We have thus a relay which is closed instantly by currents below a critical value, while if the current applied is above the critical value, the relay will refuse to close or "lock-out" unless the current is sufficiently reduced, and once closed, however, it will hang on down to almost zero current. The value of the critical current can be adjusted by altering the position of the lower sleeve.

The simplest application of this relay switch is to the automatic cutting in and out of the starting resistances of an

ordinary D.C. motor. In Fig. 1 are shown the connections for a reversing motor with remote control, with the resistance in three sections, each taken care of by a series-wound relay of this kind. When the motor is first switched on, all these

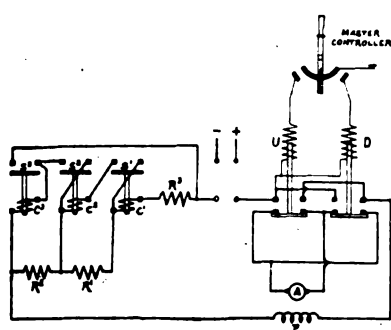


FIG. 1.

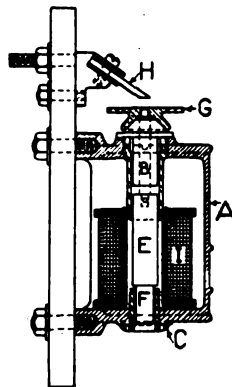


FIG. 2.

are open and current is going through the winding of one of them,  $C^1$ , which remains open, as the current is above the critical value; but as the motor gains speed and its back E.M.F. increases, the current reaches the critical value and contact  $S^1$  is closed, cutting out the resistance  $R^1$  and putting the now increased current through the coil  $C^2$  of the next relay. As the motor rises further in speed,  $S^2$  closes in the same way,  $S^1$  remaining closed till, with a further rise in speed of the motor,  $S^3$  closes, cutting all the resistance out

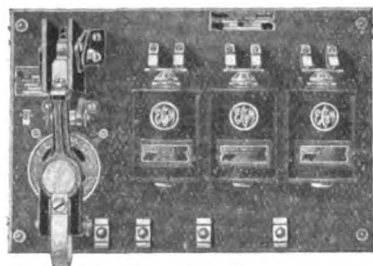


FIG. 3.—REMOTE CONTROL MOTOR PANEL.

and taking current away from  $S^1$  and  $S^2$ , which drop open. A train of these relays can, in exactly similar manner, be employed to limit the current during dynamic braking, and various other features can be added for special purposes. A starter-panel complete with three of these relays and a remote control magnetically-operated main switch is illustrated in Fig. 3, and a large number of patterns with overload attachments, main D.P. switches, and fuses, &c., are standardised, together with a variety of push-button or other control apparatus, reversing and braking controllers, all utilising the system of current-control during acceleration or braking described above.

### A NEW HIGH-TENSION FUSE

A NEW design of high-tension fuse has been introduced by Electric Control, Ltd. (177 Reid Street, Glasgow),

transmission schemes in America. The construction of the fuse will be understood on reference to Fig. 1. The principal feature is the provision of a spring which keeps the actual fuse wire in tension, and on its fusing draws one terminal back, introducing a large gap into the circuit, while at the same time a special fire extinguishing liquid is applied to the arc. The working parts are within a stout glass tube with brass ferrules at the ends. The spring  $A$  is attached to one ferrule, and at the other end to the sliding piston  $B$ , in the interior of which is a funnel-shaped opening for a purpose explained later. The actual fuse wire, which is quite short, is attached between  $B$  and the ferrule at the end of the tube, and is kept in tension by the spring. It also passes through the cork  $C$ . It is obvious, then, that when the fuse blows,  $B$  will be drawn back by the spring, as shown in Fig. 2. The whole tube is filled with a non-inflammable liquid of a dielectric strength of 250,000 volts per in., and the movement of  $B$  through it causes this liquid to be projected against the arc through the funnel-shaped opening mentioned above, and energetically circulated within the tube. Besides its efficiency in extinguishing the arc, the fuse has the great advantage of clear visibility of the fact that it has been in action. Exhaustive oscillograph tests of the breaking capacity of these fuses have been made, and in one case a 1-ampere fuse successfully opened a short-circuit of 1,170 amperes in 0.013 sec. Tests on 110,000-volt circuits with large generator capacity have shown that a very small voltage disturbance is produced. The longest time taken to open the circuit in any of these tests was less than 0.03 sec., which is stated to be at least five times quicker than the fastest working oil-switch, which usually takes four cycles on a 25-cycle circuit. The Company supply special tongs for replacing these fuses, and several descriptions of mountings. 6,600-volt fuses are made, 8 in. in length, from one to 100 amperes, and the complete range goes up to 110,000 volts, at which pressure they are standardised from one to 10 amperes and are 36 in. in length.

**The Electrical Industry and the War.**—We congratulate the Manchester Engineers' Club on having been instrumental in enlisting no less than 1,161 men in different corps. We hear unofficially that the Club's Hon. Secretary, Mr. E. L. Hill, will probably be asked to get another 800 men for the Royal Engineers.

The Hon. Sec. of the Finsbury Technical College Old Students' Association, Mr. F. R. Rouse, 15 Clifton Gardens, Golders Green, London, N.W., seeks the names and as many particulars as possible of all Old Finsbury students who have joined the Forces.

Mechanical and electrical engineers are required for the Cornwall (Fortress) Royal Engineers Electric Light Co. Territorial Force. Full particulars are given in an advertisement.

Particulars of more than 550 students who were in attendance last session and are now serving in his Majesty's Forces are in possession of the Manchester School of Technology. With a view to the completion of a Roll of Honour, including the names of past students engaged upon military service, the Registrar will be glad to receive any information as to such persons.

**Publishers' Announcements.**—Messrs. Constable & Co. have just published "Electric Cooking, Heating and Cleaning," being a manual of electricity in the service of the home, by "Housewife" (Maud Lancaster), edited by E. W. Lancaster. This book goes into the details of domestic service which can so readily and economically be obtained from electricity, is profusely illustrated, and should be in the hands of all electricity consumers, to whom it should be useful in indicating the possibilities of



FIG. 1.—EMPIRE FUSE BEFORE BLOWING.

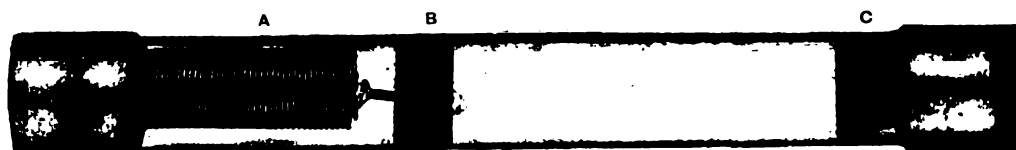


FIG. 2.—EMPIRE FUSE AFTER BLOWING.

known as the "Empire" S. and C. high-tension fuse, and is already used to a considerable extent on large power

economy and comfort combined with cleanliness, available from the utilisation of electric supply.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**RESISTANCES.**—Leaflets from the Cressall Manufacturing Company, 40 and 41 Staniforth Street, Birmingham, give prices and particulars of woven wire and asbestos resistance netting and resistance "cord" of wire wound on asbestos yarn. These products, which are largely used for heating apparatus as well as rheostats, are made entirely in the company's works at Birmingham.

**ELECTRIC HEATING.**—A neat little booklet from the Edison & Swan United Electric Light Co., Ltd. (123-125 Queen Victoria Street, E.C., and Ponders End, Middlesex), entitled "Ediswan Electric Heaters and Radiators for every Room in your House," illustrates in an attractive way rooms in which full advantage of these has been taken.

**WIRING.**—The principal features and advantages of the Stannos system of wiring with metal-cased conductors are detailed in a handsome new pamphlet from Siemens Brothers and Co., Ltd. (Woolwich), which also gives a good idea of the wide extent to which this method has been adopted by numerous illustrations of buildings wired with Stannos.

**TURBINE GOVERNORS.**—The latest form of the Pitman patent governor for water turbines is the subject of a pamphlet which has been sent us by Percy Pitman (25 Victoria Street, S.W.).

**GLASSWARE.**—A new pamphlet has just been issued by Holophane, Ltd. (12 Carteret Street, Queen Anne's Gate, S.W.), describing special Holophane Glassware for use with Half-watt Lamps, which, owing to the extreme brilliancy of the filament, render it even more important than usual that the light should be properly diffused and directed.

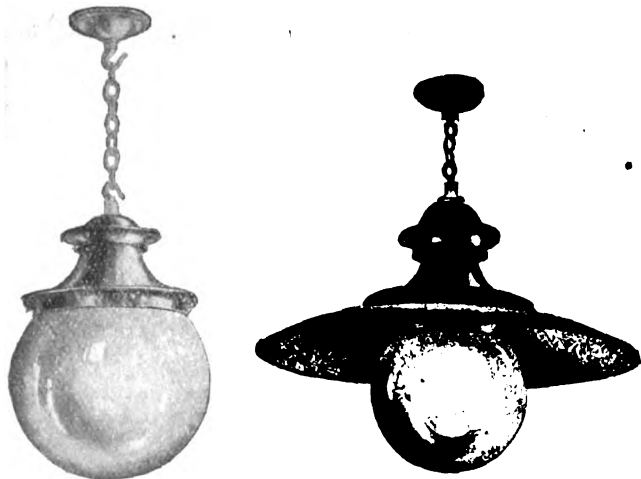
**LUBRICANTS.**—A folder from the Reliance Lubricating Oil Co., which we are glad to note is an entirely British and old-established firm, calls attention to the special points of their lubricating oils, greases, and other products.

**HEATING AND COOKING APPARATUS.**—Price lists from the Dowsing Radiant Heat Co., Ltd., give particulars of a considerable range of electric heating and cooking apparatus, including lamp and "hot bar" radiators, convectors, and radio-connectors in a number of forms, besides complete cooking outfits, ovens, kettles, hot-plates, &c., irons and soldering bits. Some of the designs formerly manufactured by Eastman & Warne, whose business has now been taken over, are included.

**INSULATING MATERIALS.**—A price list of insulating materials for all electrical purposes is to hand from L. Andrew & Co. (2 Whitworth Street West, Deansgate, Manchester).

## FITTINGS FOR HALF-WATT LAMPS

WE illustrate two new patterns of special fittings for half-watt lamps which have just been introduced by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), and added to their already long list of designs. These fittings are adopted for use either indoors or out of doors, and consist of a heavy copper spin-



"ALABAS" FITTINGS FOR HALF-WATT LAMPS.

ning, of pleasing contour, provided with an iron bush suitable for attaching to tube or hook. The lower extremity of the spinning is reinforced and provided with suitable gallery screws to hold either a plain or ribbed Alabas ball, giving excellent diffusion. The lantern is complete with a porcelain holder, and can be easily wired, after the removal of the globe, by detaching the lower portion of the holder. As is very necessary with all half-watt fittings, these "Alabas" lanterns are well ventilated and weather-proof.

## WALL PLUGS AND ADAPTERS

SEVERAL useful combinations of the special earthed wall plugs and sockets lately introduced by A. Reyrolle & Co. (Hebburn-on-Tyne) are described in a new leaflet issued by the firm. Thus in Fig. 1 two complete sockets are shown mounted back to back, forming a suitable coupling socket. Another of the numerous combinations listed is



FIG. 1.

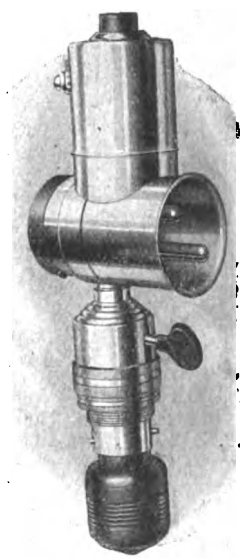


FIG. 2.

shown in Fig. 2, where two plugs and a socket at right angles are combined with a lamp-holder. In cases where more than one flexible is enabled to be taken from one socket by these arrangements, they may be connected either in parallel or in series, as, for example, to enable a dimmer to be inserted into a lighting circuit. The plain plugs and sockets are made up in several forms for horizontal and vertical entry with various styles of brushes and glands, and in a three-pin form with cast-iron case, as well as with two pins and earthing sleeve, as shown in the illustrations.

## SHOP WINDOW LIGHTING

IN view of the reduced lighting of London in connection with the scheme of aerial defence, the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), call attention to the fact that the system of shop window lighting, which they have long recommended, by

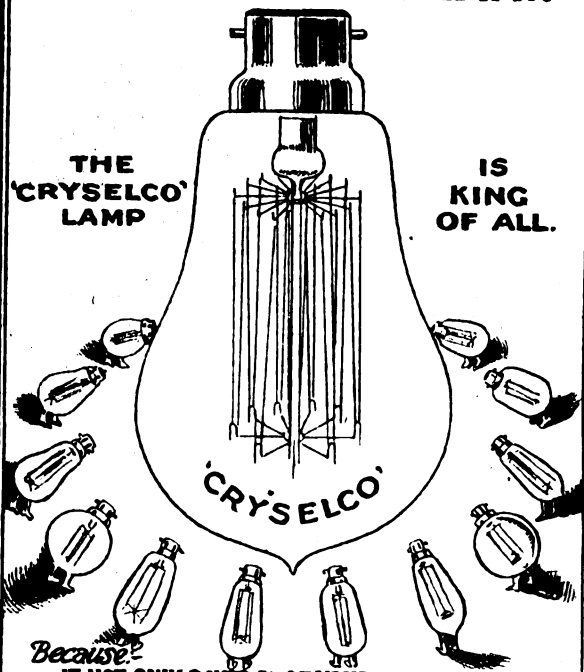


A WELL LIGHTED SHOP WINDOW.

metal-filament lamps in hood-shaped silvered reflectors, enables adequate lighting of the goods in the window to be obtained without infringing the regulations by casting light upon the pavement. The effect of such installation is shown in the illustration.

ALL OTHERS BOW BEFORE

*The*  
**CRYSELCO**  
METAL FILAMENT LAMP.



THE  
'CRYSELCO'  
LAMP

IS  
KING  
OF ALL.

*Because?*  
IT NOT ONLY SAVES  $\frac{3}{4}$  OF YOUR CURRENT BILL  
BUT IS STRONGER, BRIGHTER, &  
MORE DURABLE THAN ANY OTHER.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Barrow-in-Furness.**—In order to meet a demand of 5,000,000 units per annum for Messrs. Vickers' shipbuilding yard, extensions estimated to cost £13,000 are to be put in hand.

**Belfast.**—A special meeting of the Corporation is to be held to consider a scheme by the City Electrical Engineer based upon the recent reports of Sir John Snell and Mr. Pratten.

**Bradford.**—A loan of £52,000 is to be taken up for mains, transformers, &c.

**Hastings.**—Mains are to be laid on the Brisco Estate at an estimated cost of £1,185.

**Hawarden.**—Gas engines, generators, switchboard, storage battery, mains, &c. Consulting Engineer, J. W. Speight, Electricity Works, Ormskirk. Nov. 11th.

**Irlam.**—The Council contemplates an electric supply scheme.

**London: Hammersmith.**—High- and low-tension cable. Borough Electrical Engineer. Nov. 4th.

**Melbourne.**—The Melbourne Electric Supply Co. proposes to raise £300,000 additional capital to provide for extensions of plant.

**Oldham.**—Electrification of Wellington Works, Bradburn & Co.

**River Plate.**—The River Plate Electricity Co. proposes to raise £50,000 new capital to provide for extensions of plant.

**Southport.**—A loan of £25,000 is to be applied for. This includes provision for distributors for three years £7,500, and transformers £1,500. In addition, special expenditure upon the Ainsdale district includes high-tension cables and transformers, £900; distributors, £1,950; low-tension transformers, £800; heating and cooking apparatus, £3,000.

#### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Barry.**—Labour Exchange. H.M. Office of Works, London.

**Darwen.**—Public baths (£6,550).

**Fleetwood.**—Council school (£12,000).

**Liverpool.**—Smallpox hospital (£90,000).

**Middleton.**—New town hall.

**Preston.**—Smallpox Hospital. Town Clerk.

**Rotherham.**—Technical school (£1,800).

#### Miscellaneous

**Fleetwood.**—North Albert Street and Lord Street are to be lighted by electricity.

**London: H.M. Office of Works.**—Portable electric hand-lamps. Controller of Supplies, 18 Queen Anne's Gate, S.W. Nov. 3rd. (See advertisement on another page.)

**Walsall.**—Twelve months' supply of stores for Tramways Department. General Manager. Nov. 7th.

**West Riding.**—The Yorkshire (West Riding) Electric Tramways Co. requires a twelve months' supply of electrical stores. General Manager. Dec. 4th.

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Cardiff.**—A contract has been placed with Venner Time Switches, Ltd., for forty-nine time switches.

**Eastbourne.**—The tender of Switchgear and Cowans, Ltd., has been accepted for switchgear at £1,026. The following firms also tendered:—Electric Construction Co.; Siemens Bros. & Co.; Spagnoletti, Ltd.; Crompton & Co.; British Westinghouse Co.; General Electric Co.; B.T.H. Co.; Bertram Thomas; Ferguson Pailin; Johnson & Phillips; Cox-Walkers, Ltd.

**Edinburgh.**—The Council has purchased an electric motor-car and lorry for the Electricity Department.

**Newmarket.**—The following tenders have been received for the electric lighting of the workhouse:—Baily, Grundy & Barrett, £361 10s.; C. C. Pudney & Co., £840; Newmarket Electric Light Co., £850.

**Walsall.**—The following tenders have been accepted:—Extra high-tension and low-tension switchgear, Reyrolle & Co.; station transformers, Ferranti, Ltd.

### APPOINTMENTS AND PERSONAL NOTES

Mr. A. P. Trotter's only son, Lieut. Alexander N. Trotter, was killed in action on Oct. 12th.

Acting under a threat that every seat on the Council would be contested next month, the Northampton Corporation has decided to request Mr. J. Gottschalk, the Manager of the tramways, to resign his position. Mr. Gottschalk, although he has been in this country for twenty-six years, was born in Germany, and did not take out naturalisation papers until after the declaration of war, and considerable feeling has been shown in the Council over the matter. The Tramways Committee has already passed a vote of confidence in their Manager, and this was subsequently confirmed at a meeting of the Corporation. Certain people in the town, however, were determined that Mr. Gottschalk should resign, and as a result of their action the Corporation has come to the decision mentioned above, at the same time giving Mr. Gottschalk £300 compensation.

A few first-class telephone mechanics and instrument-makers are required at the Woolwich Dockyard. (See advertisement on another page.)

Three switchboard attendants are required in the Edinburgh Corporation Electricity Department. Applications to City Electrical Engineer, Dewar Place.

A switchboard attendant is required in the Burnley Electricity Department. (See an advertisement on another page.)



## LOCAL NOTES

**Basingstoke: Inauguration of Electric Supply.**—The new electricity works of the Council were formally opened on the 15th inst. The plant consists of two 150-h.p. Diesel engines coupled to two 100-kw. Phoenix dynamos. There is also a 270-cell Hart accumulator, the makers having entered into a maintenance contract at £60 9s. per annum for ten years. The switchboard has been supplied by Cox-Walkers, Ltd. The supply is given on the three-wire system at 460 and 230 volts. Although the undertaking is necessarily on a small scale, the Council has arranged a generous tariff which should do much to encourage consumers to come on to the mains. The lighting flat rate is 5d. per unit, with discount to 4½d. in the case of large supplies; churches, hospitals, hotels, &c., are supplied at 4½d. per unit, outside shop lighting at 3½d., and for power and cooking and heating the charge varies from 2d. to 1½d., according to quantity. Already the L. & S.W. Rly. Co. guarantees to take 50,000 units per annum. The capital expenditure has been £13,600, and much of the work of organising the scheme has been carried out by the Borough Engineer, Mr. F. R. Phipps. The Borough Electrical Engineer, Mr. G. Broadhurst, acted as Clerk of Works during construction, but has now charge of the undertaking.

**Bradford: The 5,000-kw. Bergmann Turbine.**—The report of the Electricity Committee upon the year's working to March 31st refers to the 5,000-kw. turbo-alternator which was ordered in January from the Adnil Electric Co., who are the agents in this country for the Bergmann Electrical Works of Berlin. At the outbreak of war the work had so far proceeded on this set that it was being erected on the test-bed at Messrs. Bergmann's Works. In view, however, of the impossibility of obtaining delivery of this plant, and the urgent necessity of having such a machine in commission at the Valley Road power station at the earliest possible date, the Council in September (ELECTRICAL ENGINEERING, Sept. 3rd, p. 490) placed an order with the British Westinghouse Co. for a 5,000-kw. turbo-generator, which is to be installed on the bed prepared for the Bergmann machine. It is not anticipated, however, that this set will be available for use until early next summer; but as, owing to the war, the load on the works will probably not increase to the extent it otherwise would have done, it is hoped that no difficulty will be experienced in maintaining a satisfactory supply during the winter months with the generating plant already installed, especially if it is found possible to put the new storage battery into commission before the end of the year. The condensing plant and switchgear for the new turbo-alternator have been delivered and almost erected, whilst the battery is now being installed. The foundations are now ready for the induced-draught plant, and the battery, boosters, and work in connection with the battery switchgear and rotary-converter is well in hand by the various makers.

**Electric Cooking and Heating.**—In order to popularise the use of electric cooking apparatus, the Electricity Committee has equipped a complete electrical outfit capable of cooking a meal for 500 persons at the Central Baths in Moseley Street. It is hoped by this means to induce a number of restaurants in the city to follow the lead of London and large provincial cities by adopting electricity for cooking and heating purposes. Incidentally, it may be mentioned that last year, whilst the output and revenue of the electricity undertaking increased considerably, the working expenses per unit sold were the lowest on record, viz., 0.568 per unit, this figure, of course, being exclusive of capital charges.

**Croydon: The London Electric Supply Scheme.**—There are already signs that the local authorities in and around London are not very favourably disposed towards the principle of the L.C.C. new power scheme. Croydon is a case in point, and together with others of the larger municipalities views the scheme as the thin end of a wedge towards complete absorption into the London County area. The present feeling in Croydon seems to be on no account to part with the control of the municipal electricity undertaking.

**The French Red Cross Society.**—A French Committee, which has been formed in the Newcastle district for the assistance of dependants of local residents who have joined the forces of our Allies, has undertaken also to collect funds for the French Red Cross Society, which is in urgent need of financial assistance. Donations may be sent to A. Reyrolle, Esq., Messrs. A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £52 10s. to £53. (Last week the same.)

**Heating and Cooking Apparatus.**—The Dowsing Radiant Heat Co., Ltd. (105 Gt. Portland Street, W.), inform us that they have purchased the goodwill, stock, plant, and machinery of Messrs. Eastman & Warne, who have hitherto carried on the manufacture of electric heating apparatus at Acton Vale. The machinery, &c., will be transferred to the Dowsing Works at Acton.

**Limmer Asphalte.**—In order to remove misconceptions that may have arisen, the Limmer Asphalte Paving Co., Ltd. (Caxton House, Westminster, S.W.), point out that the Company is entirely British owned, and has no property in Germany or Austria, that its principal supplies come from mines in France and Sicily and from British Colonies, and that they have never purchased artificial "bitumens" from the Continent. The Directors are all Englishmen, and not a single German or Austrian is in their employ.

**Wm. Sanders & Co.**—We are requested to state that the firm of Wm. Sanders & Co., Ltd., just registered as a new company, is in no way connected with the well-known firm of Wm. Sanders & Co., Switchgear Manufacturers, Falcon Electrical Works, Wednesbury, and 90 Charing Cross Road, W.C.

**S. African Agency.**—An English agent in S. Africa, hitherto representative of prominent German electrical firm, wishes to get into communication with United Kingdom manufacturers of electrical machinery and supplies. Further particulars at 73 Basinghall Street, E.C.

**Callender's Cable and Construction Co.**—The usual interim dividend at the rate of 10 per cent. per annum is to be paid on the ordinary shares for the past half-year.

## NEW COMPANIES

**E. M. EVANS & SON**, 1 Lever Street, Piccadilly, Manchester. Capital £3,000. To take over existing electrical contracting business.

**SIMPLEX SELF-STARTERS.**—Registered by Jordan & Sons, Chancery Lane, W.C. Capital, £10,000. To manufacture electric and other apparatus for starting motor-cars, motor-boats, aeroplanes, &c.

**HIGHFIELD & CO.**—Registered by Jordan & Sons, Chancery Lane, W.C. Capital, £1,500. Manufacturers of electrical appliances, switchboards, &c.

**PHOENIX ELECTRIC HEATING CO.**, 16 and 17 Morwell Street, Tottenham Court Road, W.C. Capital, £3,000.

**A. V. GIFFKINS & CO.**, 68 Victoria Street, London, S.W. Capital, £10,000. Manufacturers of and dealers in all classes of electrical machinery and apparatus.

**DERBY LAMP WORKS**, 9-10, Pancras Lane, E.C. Capital £85,000. To manufacture electric lamps, &c.

**NORTH BRITISH ELECTRIC WELDING CO. (EASTERN)**, 45, Hope Street, Glasgow. Capital, £4,000.

**Arrangements for the Week.**—(To-day) Thursday, Oct. 29th. Institution of Electrical Engineers. Presidential Address by Sir John Snell. 8 p.m. A marble bust of Michael Faraday will be presented to the Institution on behalf of the late Sir W. H. Preece, F.R.S.

Tuesday, Nov. 3rd. Institution of Electrical Engineers. Manchester Section, at Engineers' Club, Albert Square. Chairman's Address by Mr. P. P. Wheelwright. 7.30 p.m.

Wednesday, Nov. 4th. Institution of Electrical Engineers. Yorkshire Section. Chairman's Address by Mr. T. Roles. Smoking Concert to follow, 7.30 p.m.

**Institution of Civil Engineers Awards.**—Among the awards for papers read before the Institution of Civil Engineers last session was a Miller prize for the student's paper by Mr. W. E. Gurry, on "Air Filtration, including Ventilation of Electrical Machinery."

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

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THURSDAY, NOVEMBER 5, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

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United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

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OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

### Latest Time for Receiving

Letters for Insertion, *Tuesday first post.*

Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

Corrections in Standing Advertisements, *Monday first post.*

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

SIR JOHN SNELL'S Presidential Address to the Institution of Electrical Engineers last Thursday covered a variety of subjects. He put in a plea for the better remuneration of young engineers and for preference to be given to members of the Institution; he expressed himself in favour of the I.M.E.A. Bill, and viewed the questions of bulk supply and the future charges for electricity from an interesting standpoint (p. 370).

An extremely generous contribution to the war relief funds and their own special relief fund has been made by the Westinghouse employees (p. 572).

THE general question of electric power in collieries was reviewed by Mr. R. Holiday in his presidential address to the Association of Mining Electrical Engineers (p. 572).

A REPORT from New South Wales states that no electrical accidents occurred in 1913 there (p. 572).

THE improvement or power factor on mining electrical installations is discussed in a Paper read recently before the Association of Mining Electrical Engineers (p. 575).

AN improved electrical gas detector is described (p. 576).

THE advantages of electrical winding were mentioned in one of the branch president's addresses of the Association of Mining Electrical Engineers (p. 576).

THE effect of overloads on supply meters is discussed in our Questions and Answers columns (p. 576).

THE L.C.C. is recommended to proceed next Session with a Bill dealing with the supply of electricity to London and the surrounding districts (p. 577).

WE publish a preliminary announcement with regard

to Messrs. A. P. Lundberg & Son's Electric-Light Switching Competition (p. 577).

THE Court of Appeal has decided that the issue of a circular by the Long Eaton Urban District Council limiting their lowest power rates to consumers who took current for all their lighting as well as for power was "undue preference," and in contravention of the Electric Lighting Act of 1882 (p. 578).

WE are able to give the names of the members of the Signal Company of the Royal Naval Division which has been recruited by the Institutions of Electrical, Civil, and Mechanical Engineers (p. 578).

A NUMBER of Englishmen on the staff of the Constantinople Telephone Company are believed to be still in Constantinople (p. 578).

THE subjects of the Patent Specifications published last week include current transformers, connections of condensers for wireless telegraphy, a metal-cased hand combination telephone, a system of water-heating, and construction of battery plates. An application for suspension of certain magnetic clutch patents owned by Germans has been refused. The patent for the Sykes insulated rail joint is expiring (p. 579).

HALF-WATT lamps are now available for motor-car headlights. In our Trade Section we describe recent patterns of electric fires, street lanterns, and dimmer fittings, and give some particulars of the enemy's trade available at the Board of Trade (p. 581).

A 1,500 kw. turbo-alternator is required at Blackpool; a 250 kw. single-phase transformer at Atherton; mains at Finchley; an expenditure of £17,000 is contemplated at Stoke-on-Trent; generating plant is required by the Port Elizabeth (S.A.) Council; and a good market for electrical goods is reported from Russia (p. 581).

THE Belfast Corporation has decided not to erect a new power station at present.—Satisfactory progress is reported at the Chester water-power electricity works.—The Birmingham Electricity Committee is paying £4,500 a year in allowances to workmen on active service (p. 582).

**Arrangements for the Week.**—Tuesday, Nov. 10th. Institution of Railway Signal Engineers, at Institution of Electrical Engineers. Reply by A. H. Rudd to discussion on paper, "American Signal Practice as compared with British Practice." 2.30 p.m.—Institution of Electrical Engineers: Scottish Section, at 207 Bath Street. Address by Chairman, Mr. J. Lowson. 8 p.m. Thursday, Nov. 12th. Institution of Electrical Engineers. "Cables," by C. J. Beaver. 8 p.m.—Greenock Electrical Society, 21 West Stewart Street. "Rotary Converters," by Philip C. Kerr. 7.45 p.m.

**B.T.-H. Recruiting.**—A telegram reading as follows has been received from the Melbourne House of the company: "Congratulations you sending over nine hundred fighters to front. We are proud of them. God speed and victory." Since the notice prompting this telegram the number has increased to considerably over one thousand.

## OPENING MEETING OF THE INSTITUTION OF ELECTRICAL ENGINEERS

THE opening meeting of the 1914-15 session of the Institution of Electrical Engineers took place on Thursday, October 29th, there being a good attendance. Mr. W. Duddell, F.R.S., the retiring President, was in the Chair and conducted the formal business before Sir John Snell succeeded him.

It was announced that Col. H. C. Leaf has been appointed a member of the Council in place of the late Mr. A. B. Anderson.

A vote of thanks was accorded to Mr. Evelyn Barnard, a great-nephew of Faraday, for his kindness in presenting to the Institution a framed iron-filings diagram made by Faraday and initialled on the back by him.

The premiums and scholarship cheques were then presented. A list of these was given in *ELECTRICAL ENGINEERING* of May 21st, p. 281.

The next business was the presentation of a bust of Faraday by Mr. Llewellyn Preece on behalf of the late Sir William Preece. In making the presentation, Mr. Preece mentioned the promise by Sir William two and a half years ago, on the occasion of the presentation of the Kelvin bust to the Institution, that he would do his best to present the Institution with a similar bust of Faraday. Unfortunately, Sir William's illness considerably delayed putting the work in hand, but eventually it was placed in the hands of Mr. G. D. MacDougald, the sculptor, who has worked largely under the supervision of Professor Silvanus P. Thompson, to whom, Mr. Llewellyn Preece said, great thanks were due for his advice, which had assisted in producing such a speaking likeness of Faraday.

Mr. Duddell offered the Institution's most sincere thanks for the bust, and referred to the splendid work done by Sir William Preece on behalf of the Institution.

He then vacated the Chair in favour of Sir John Snell, the new President, and, on the motion of Prof. S. P. Thompson, seconded by Dr. Gisbert Kapp, was accorded a hearty vote of thanks for his services as President during the past two years.

### THE PRESIDENTIAL ADDRESS.

Sir John Snell then read his Presidential Address, which touched upon a variety of topics. The following are the main points dealt with by him:—

*The Industrial Committee.*—In connection with the disbandment of this Committee by the Council, after only a short life, Sir John repeated the reason for this already given by the Council. It was, he said, a much more difficult matter to deal with than the critics of the Council's action had appreciated.

Some of the matters referred to this committee, he said, were of a controversial nature, and to give decisions on controversial subjects affecting two sections of the industry which may happen to be opposed in their views must necessarily involve serious and sometimes insuperable difficulties. In his opinion there must be, apart from the Institution, separate bodies to deal with their own immediate and particular interests (for instance, the I.M.E.A., the B.E.A.M.A., the Electrical Contractors' Association, the Tungsten Lamp Association, and the Power Companies' Association), the interests of any two of which might be diametrically opposed in certain cases. On the other hand, the Institution must adopt a sympathetic attitude towards each and all of them, and be ready to help them, or, if asked, to arbitrate between them. He thought that some organisation could be created which would be constantly ready to consider any question that might arise from among the many sectional interests which the Institution incorporates, and suggested the formation of a standing Advisory Committee, composed of the President, three Past Presidents, and three Members of Council. This Committee might be given power to add to its number, choosing from among other members of the Institution. He did not know how this suggestion would commend itself to the Council, and was only expressing his own opinion.

*Organised Lectures.*—It had been suggested that the Institution could do good work by organising lectures in various parts of the country, to educate people in the applications of electric power, lighting, heating, and cooking, but from his past experience this could be more effectively dealt with by the electricity undertakings locally.

*The Textile Committee.*—In 1911 the Council were invited to form a committee to investigate the subject of the electric driving of textile mills, in connection with the Textile Institute. Several meetings were held in Manchester, but they came to nothing, and the Joint Committee was disbanded, because the Textile Institute desired to cover a wider field and to inquire into the relative merits of all available prime-movers whether electrical, steam, gas, or oil. The work of the Joint Committee, however, was not in vain: it awoke the Textile Institute to action in this respect, and in the meantime several mills had changed over to electrical driving and the results of their experience formed a better advertisement than a report from any Joint Committee.

*Model General Conditions.*—Sir John expressed approval of the Institution's new "Model General Conditions for Contracts," expressing the opinion that they establish a very fair relationship between the Purchaser, the Contractor, and the Engineer, and the hope that they will find general acceptance and adoption.

*Remuneration of Young Engineers.*—The Council had been asked at various times to assist in finding positions for their younger brethren and to regularise and improve the status and pay of young engineers, but he did not see that it could very well become either a Trades Union or even a Labour Bureau. He was certain, however, that there are serious causes for complaint from the younger electrical men. He asked fellow-members who are Heads of Departments to give, so far as is reasonable and proper, a preference to applicants who belong to the Institution, and, in fixing salaries, not to think so much of recording a small fraction of a penny less per unit sold on the costs sheets, but to remember first that we were all at one time juniors, that the price of living has gone up and is going up, and that the best can be expected from anybody only if he is adequately paid, and if reasonable opportunities for advancement are held out to him.

*National Service.*—The result of Mr. Duddell's circular sent out at the instance of the specially appointed National Service Committee was that nearly 500 members of all classes offered their services, and a very large majority had volunteered either for service at home or abroad. It was first intended that the Institutions of Electrical, Civil, and Mechanical Engineers should form an "Engineering Institutions" Battalion for service in the field, and that the Institutions should clothe, house, feed, and train the recruits, until the battalion could be handed over to the War Office in a condition of complete readiness. The Institution had been particularly indebted to one of its members, Major-General R. M. Ruck, C.B., R.E., for his invaluable counsel and assistance and for his influence at the War Office. There then came an unexpected proposal that these three Institutions should recruit the Engineer Units for the Royal Naval Division, just then authorised to be formed. The response was so spontaneous that the corps was formed within a few days by men not only of splendid physique, but also of highly skilled intelligence, professional men trained in various branches of engineering, and forming a personnel of the highest value to the Admiralty. All three Institutions owe Mr. W. Duddell, F.R.S., Mr. A. P. Trotter (who was one of the originators of the movement), Mr. Robert Hammond, Colonel D. E. Ruck, R.E., and Mr. Rowell and his staff, who were all indefatigable in their labours as recruiting agents, a great and lasting debt for their untiring energy and enthusiastic assistance in this loyal movement.

It is not the first time, Sir John Snell continued, that the Institution has been instrumental in showing its loyalty to our King and to the Imperial cause. In 1896 the Council appointed a Volunteer Service Committee on which, among others, the late Dr. John Hopkinson, Sir John Snell's old chiefs, General Webber and Colonel Crompton, and Sir Alexander Kennedy, gave their assistance; and in the January of that year Dr. Hopkinson before beginning his Presidential Address announced the suggested establishment of the Corps of Electrical Engineers (R.E.) Volunteers. The Secretary for War appointed a small Departmental Committee to go into the question, and ultimately provision was made in the Army Estimates, and Dr. John Hopkinson was appointed to be the first commanding officer. The first training took place in the autumn of 1897, and during the following year over 100 volunteers were enrolled. At the time of the South African War the Corps volunteered to provide a contingent for active service in South Africa, members of the Institution subscribed to provide a fund for the purchase of field plant, and in 1900 the fully equipped contingent embarked at Southampton for South Africa. No less than 330 out of a total strength of 500 served their country in this campaign. The Electrical Engineers (Territorial) R.E. battalion is in the King's service to-day, and the members of it are on duty under the command of Lieut.-Colonel Le Rossignol, R.E., at several of the important defence works. Only the other day one of the officers of the Corps wrote to ask Sir John if the Institution's influence could be exerted to enable some of them to go to the front—over 70 per cent. of the officers and men having volunteered for active service. Many members are also serving in the Signalling Corps of the London Army Troops under Colonel E. H. Leaf, R.E., men able to utilise their skilled experience in telegraphic and wireless services.

*Legislation.*—No case has, of course, yet arisen from which an indication can be gleaned of what will be the interpretation of the terms of purchase under the Electric Lighting Act of 1888. Under tramways purchase procedure the value to the seller is taken based on the cost of replacing the plant and mains, &c., as they are at the time of purchase, but reduced by an amount for depreciation, having regard to the then ages and the estimated useful lives of the component parts. The Electric Lighting Act terms are, however, enlarged as compared with the tramway terms, in that allowance has to be made for the undertaking's being in a condition ready to supply, and an allowance for severance has to be made if the municipal and electrical areas are not the same. Thus some difficulties will no doubt arise when the purchase of the earlier undertakings falls in in 1924, and there will be plenty of work then for the Bar, and also for a few members of the Institution.

Except in the further facility needed to allow undertakers to establish showrooms and to let fittings on hire, with due regard to the interests of electrical contractors, Sir John does not see that much improvement can be suggested on the present

laws affecting the supply of electricity. He feels, however, that the suggested Advisory Committee might review the present legislative position, compare it with the legislation affecting water and gas undertakings, to see whether there are any further facilities or improvements which could be enacted, such as the "protection of property" clause, for example, and facilities for wayleaves where consent is unreasonably withheld.

Sir John expressed his regret that the electrical profession has not some members in Parliament to represent it, and suggested that a few should volunteer and offer themselves at future elections.

Referring to the I.M.E.A. Bill, the President said that, as now drafted, it had received the support of the Manufacturers' Association, but he understood that the Contractors' Association does not approve of it. Speaking from an entirely detached and independent position, he could not but feel that non-agreement is regrettable and contrary not only to the public interests, but to the interests of the contractors themselves. Contractors would not be competed with by the supply authority in any wiring contracts, and although there would be competition in "providing, selling, letting on hire, fixing, repairing and maintenance of fittings, apparatus, and appliances for lighting, heating, and motive power," there were proper safeguards to prevent the public authority from undercutting contractors. He supposed that supply authorities did not want to make profits out of the sales of apparatus so much as to increase the output and revenue from energy sold; and surely a reasonable compromise could be arrived at which would be mutually advantageous. Increase of business should be the first direct result of the passing of a Bill of this nature, and therefore more wiring contracts. The addition of such a measure to the existing Electric Lighting Acts would appear to be of immense value to all interests, and a way should be found to pass it in a form which would bring the greatest benefits to contractors as well as to the supply authorities.

**Bulk Supply.**—Both points of view were considered in the Address. In some cases where there are existing small power stations, some of them unfavourably situated for cheap generating costs, it would probably pay to extend one of the better placed stations only and to supply the others therefrom, rather than to extend each local station from time to time. A case in point was mentioned, in which there are five separate electric power stations within a radius of six miles, four of which are not favourably situated, either for coal supply or for water, while the fifth and largest place has a waterside station. In this case concentration at the larger station would far outweigh the extra costs of transmission cables and transformer plant and the losses in transformation. On the other hand, once a small station is built and the expenditure has been incurred, the extra operating cost of an addition to the local power station is often cheaper than any commercially feasible bulk supply. He had had to inquire minutely into many such cases, and in most of them the decision had been to extend the local plant. A case arose a short time since where a comparatively small station—less than 2,000 kw.—required supplementing. The annual load factor, based on 30 minutes' sustained load, was 36 per cent. A neighbouring very large undertaking offered a bulk supply at very low terms—far lower than any terms yet mentioned in the various London power schemes. Yet it was impossible to demonstrate that it would pay to purchase all the energy locally required from the bulk supplier, because of the dominating effect of the capital outlay and the standing charges on the existing local plant. Finally, the best terms were made for both parties by the local station undertaking to run its plant for one shift during only four months of the year, thus entirely taking the local load off the winter demand of the bulk station—that is to say, a co-operative system such as was proposed in the original London County Council schemes seven years ago. Sir John Snell finally expressed the opinion that no economy can be shown in the generality of cases where there are modern and properly managed undertakings whose capital expenditure on buildings and plant is not yet redeemed or written off, unless energy can be supplied by a bulk authority at rates not exceeding £2 10s. per kw. of maximum demand and 0.25d. per unit delivered for untransformed high-tension energy. He recommended, however, that in the case of a new local area it would be well to obtain terms from a bulk-supply authority before deciding to build a local power station; or, better still, in many cases for the local authority to find the capital to build its local sub-stations and to lay its distributing network at probably cheap rates of interest, but to arrange for the administrative work and upkeep of the local system to be undertaken, under proper supervision, by the bulk authority. He suggested that a complete survey should be made by the Local Government Board of the present position of all the electrical authorities, so that in those cases where amalgamation or purchase of energy from an outside source ought to be adopted the Board would decline to sanction any loans for local plant extensions.

**Domestic Supply.**—Sir John expressed the definite view that the cost of two independent systems of wiring in one residence is a brake upon progress. After mentioning that electric lighting was now "almost unnecessarily cheap," he exhibited Fig. 1 (from an actual case) to show the very great diversity indeed

between the lighting and cooking loads. It shows that while the lighting and power connections are steadily rising, the heating and cooking connections are increasing at a greatly accelerated rate; but the maximum load on the power station is rising proportionately to the lighting and power only, and is practically unaffected by either the heating or cooking additions. Analyses of daily load curves showed that the daily load factor in the summer had increased from 26 per cent. to 37 per cent. for comparable days in three successive years, and in the winter from 38 per cent. to 42 per cent. The effect on the daily load factor was therefore more marked in the summer, and the result was to level up the daily load factor throughout the year. Confirmatory results had been obtained in other districts. It was

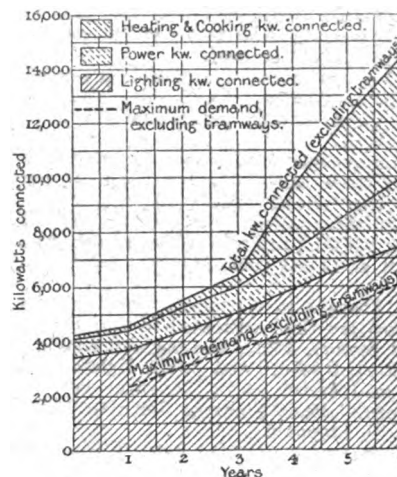


FIG. 1.

safe to say that a great increase in the output for the purposes of domestic supply must be provided for. In some cases he found that the ratio of other domestic units to the lighting units is as high as 10 to 1. An average of all the private residences in one provincial town gave a ratio of 3.5 to 1; shops, however, only gave a ratio of 1.2 to 1, while offices gave the highest ratio, viz., nearly 5 to 1. He thought it quite probable that in the near future existing consumers who now take energy only for lighting or heating to a very limited degree would be purchasing from 4 to 5 times the number of units metered at present. The increased load factor and larger output will react on and reduce the costs of production, and increased output of utensils and apparatus will reduce their cost. Initial outlay is usually the greatest deterrent to the adoption of an electrical supply, and, why, he asked, should a consumer have to pay for two separate and complete wiring systems in his house? The single wiring would mean an adjustment of the rates to suit the circumstances, and he looked forward to a general rate of 1d. per unit for domestic supply, although the time was not quite ripe yet. For the present, most undertakings must have recourse to either a fixed charge per kilowatt (or fraction of a kilowatt) connected, plus a minimum charge per unit metered, or where assessments permit, a fixed charge based on the rateable value, plus the running charge per unit metered.

**Future Charges to Consumers.**—"We have heard of prices such as a farthing per unit, and even one-eighth of a penny. To my mind it is unwise to speak loosely of sensational figures like these unless there is substantial evidence to support them." With his introduction, Sir John proceeded to estimate roughly the limits to which charges might be expected to be reduced under existing conditions. The average cost to the consumer in this country, he said, is now 1.56d. per unit, and in London it is 2.15d. Making a short digression, he first referred to the tendency on the part of the larger cities such as Manchester, Glasgow, and Birmingham, to sell in bulk to their neighbouring and surrounding towns and districts, and the better disposition on the part of such smaller districts to take the supply from their larger neighbours. Fear that the electrical supply is the "thin edge of the wedge" of complete municipal absorption by the larger city represented one of the principal obstacles, in addition to the one already pointed out. It had proved to be very hard work to build up the power companies, and very few could be said as yet to be in a really sound financial position, although they had done valiant work. The principal towns already had their own power stations, and desired to have electrical undertakings under municipal control, and the difficulties of obtaining wayleaves for transmission lines, the capital cost of transmission, together with the cost of money itself, had all been, and still were, obstacles to the development of such large areas of operation. Some of these difficulties, he said, are yielding. Many local authorities are now more disposed to consider the alternative of bulk supply. The cost of transmission by cables at high pressure is very much less than it was a few years ago. The Board of Trade helps, so far as legislation now permits, in the development of overhead lines. There were many factors to be considered, and undertakings above a certain size



and output were bound to continue independently. Faraday had once remarked that we must be "not too hasty to generalise, and above all things willing at every step to cross-examine our opinions." This was wise counsel, and, after due self cross-examination, Sir John said that he still holds the opinion that in this country the local undertakings in the majority of cases will not be merged in larger and widely distributed systems.

Returning to the question of minimum cost of supply, he took an ideal case of generation on a large scale from power stations dependent on fuel, and transmission to various parts of an extended province, partly by overhead lines at 30,000 volts, and partly by high-tension cables. He assumed further that the output embraced a supply to railways and other traction systems, wide classes of industries, and also that the domestic supply reached the extended application which he had suggested. The resultant average annual load factor at the power stations might then possibly reach 50 per cent.

The detailed cost of such a power station per kilowatt could be taken typically as follows: Land, &c., £0.25; buildings, &c., £2.00; boiler plant, £3.25; generating plant, switchgear, &c., £2.65; total, £8.15.

Including the generating costs and interest at 5 per cent. and depreciation of these capital charges, the total cost per unit sold would work out as follows: Equivalent generating costs, 0.247d.; distribution, 0.054d.; rents, rates, and taxes, 0.050d.; management expenses, 0.022d.; capital charges on sub-stations and mains at £25 per kw. at 11 per cent., 0.167d.; total cost per unit sold, 0.54d.

The proper charges to consumers (allowing for a reasonable diversity factor) are then estimated to be:—Lighting (12½ to 15 per cent. load factor), 1.2d.; heating and cooking (40 to 45 per cent. load factor), 0.447d.; and public lighting, and also power, according to load factor as in the curve below (Fig. 2). For special "non-peak" loads a charge down to 0.15d., according to circumstances, is proposed.

Now, Sir John points out that even if the cost of coal could

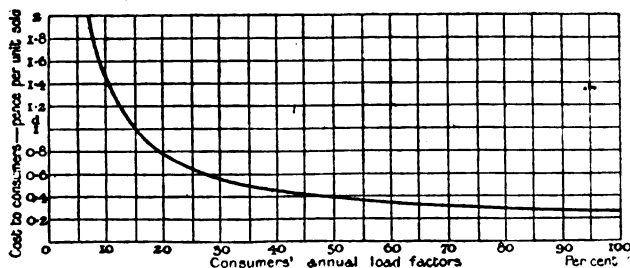


FIG. 2.

be eliminated—such as the sale of by-products, which would balance the coal cost, the average cost of 0.54d. would only be reduced to 0.40d., and the average charges to lighting consumers would still have to be 1½d., while industrial consumers with ordinary load factors would have to pay prices ranging from 0.66d. to ½d. if the costs were properly apportioned. Or, again, if the capital cost of the complete undertaking were reduced to half of that taken as a basis in the above figures, which would mean only £4 per kilowatt installed for the power house, and £12.5 per kilowatt installed for the sub-stations and mains (figures one may safely say cannot in any reasonable probability be ever reached), still the average cost of a 50 per cent. load factor would be 0.42d., and the lowest permissible charge to a lighting consumer would be 1½d., and to an ordinary industrial consumer from ¾d. to ½d.

This section of the Address concluded with a plea to engineers to assist in preventing wastage of our great national asset, coal. The greatest losses occur in the steam-raising plant, of course, and in the heat rejected to condensers. Station engineers, he said, would do well to keep a regular log of the analysed losses and go further than merely checking the thermal values of coal purchased and the weight of coal per unit generated. He thinks that it would pay in all but the smallest stations to have an assistant whose duties would wholly consist in noting the thermal values from the coal consumed right down to the remaining value per unit delivered to feeders, so as to improve the results and to minimise waste.

**Capital Investment in Electrical Works.**—As an indication of the development of electrical undertakings and companies in the British Empire, the following figures show a remarkable amount of capital invested:—310 manufacturing companies, £46,703,047; 173 miscellaneous companies, £8,756,417; telegraphs and telephones, £37,249,088; 269 electrical supply companies, £58,364,885; 262 municipalities, £49,656,951; 104 tramway undertakings, £56,012,466; total, £256,742,854. This huge total does not even then include Government telegraphs and telephones, power companies, or the capital invested by railway companies in electrification, which would greatly increase this total. When one considers that in a period of thirty years over 250 million sterling has been invested in electrical undertakings of various kinds, none can deny that electricity has become indispensable to the service of mankind.

**Trend of Improvements.**—We are, said Sir John, gradually arriving at definite and accepted methods: Three-phase generation, turbo-alternators of the highest adaptable speed coupled to machines with one bar per slot and having the lowest consequential terminal pressure, stepping up through static transformers, higher feeder pressures, and distribution by the three-phase four-wire system.

In the manufacturing section steady progress towards standardisation is being made. If plant of whatever kind can be turned out in quantities, the articles are cheaper. Whether it be units of energy or motors, the curve of cost per unit or per motor will be hyperbolic. There are fixed charges and running charges in both, and the greater the quantity, the smaller the cost of each. Some Continental competitors, by absorbing the fixed charges at home, have delivered machines and materials here at prices which have been based on the "running costs" only. In so doing, however, they have improved their own factory load factor and increased their prosperity. Our manufacturers have an opportunity now. Sir John deplored the waste which takes place in most cities through the constant taking up and relaying of pavements by the gas, water, telephone, and electrical authorities, and advises some co-ordination. In the design of extensions of the distributing systems themselves he maintained that unnecessary copper and lead are often laid down in a hurry, when a skilled consideration of plans prepared well in advance would generally result in economies, while affording at the same time a better pressure distribution and greater facilities for sectionalising the system in emergencies.

A vote of thanks to Sir John Snell for his interesting address was proposed by Mr. W. M. Mordey, seconded by Mr. C. H. Wordingham, and carried by acclamation.

## THE BRITISH WESTINGHOUSE COMPANY AND THE WAR

AT the outbreak of the war the British Westinghouse Co. found it necessary to put the workmen on reduced time, and also to reduce the salaries of the staff to two-thirds. Business rapidly improved, however, and full time was reverted to, and not only were the salaries of the staff made up to normal again, but, as the staff had been working full time in spite of reduced salaries, the previous reductions were returned to them as back salary. A large proportion of this was allotted by the members of the staff to the Prince of Wales's and other relief funds. A total of £1,170 was distributed.

Shortly afterwards it was decided to start a fund to which all employees of the Company could contribute by the week or month, by authorising the Company to make deductions from their salaries and wages, to form a stand-by fund primarily to be paid to Westinghouse employees, and that, if necessary, it should be used to augment the grants already paid by the Company to dependents on Westinghouse employees, out of the £100 per week set aside by the Company for the purpose. Up to Oct. 21st the sums so deducted from salaries and wages amounted to £974.

No less than 950 men have left the British Westinghouse Co. up to date to join either the Army or Navy.

**Electric Cooking on Submarines.**—It is not generally known that one of the most successful applications of electric cooking is on submarines. On all, or at any rate a great number of British submarines, the cooking is done by electricity with current supplied by the battery which furnishes the power to drive the vessels when submerged. We understand that various makes of cookers are employed.

**The War and the Professional Classes.**—A number of influential men and women have formed an association known as the Professional Classes War Relief Council, presided over by Major Leonard Darwin. The very excellent object of this Council is to form and administer a fund to assist those of the professional classes not coming within the range of the other relief schemes who may be in straitened circumstances owing to the war. Donations may be sent to the Treasurer, Professional Classes War Relief Council, 13 and 14 Princes Gate, S.W.

**Electrical Tar Separation from Gas.**—It has sometimes caused amusement that electric power should be employed in the gas industry, and it is interesting to note another application of electricity in gas purification described in our contemporary, the *Gas World*. This is the application of a high-tension discharge at 40 to 80,000 volts to produce a highly ionised field through which the gas is passed. This causes an agglomeration of tar spray or mist into large drops which are easily separated. The step-up transformer is contained within the ioniser so that there are no exposed high-tension leads. The apparatus is in use with success for detarring gas at a coke-oven plant at Detroit, and has also been used for cleaning producer gas at the Ford Motor Co.'s works, Detroit.

## ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Published on the First Thursday of each month

### ELECTRIC POWER IN COLLIERIES

AT the annual meeting of the Association of Mining Electrical Engineers last month, Mr. R. Holiday (General Manager, Ackton Hall Colliery), the new President, gave his Address, entitled, "The Economic Justification for the Use of Electrical Power in Collieries." As the value of electric power began to be realised for colliery purposes, many generating plants driven by high- and low-speed engines were put down; but it was the introduction of the low-pressure and mixed-pressure steam turbine that gave the use of electric power in collieries the necessary incentive to ensure its almost universal adoption. There were to-day numerous cases where the power obtained from the energy remaining in the steam which was exhausted from the non-condensing winding engines was sufficient not only to provide for all auxiliary requirements of individual collieries, but to provide a surplus from a group of pits to drive another pit wholly by electric power, including the winding engines. The same applied to some extent to the gas engine using waste gases from by-product coke-oven plants. During the initial fight against electric power as a new thing the principal point urged against its use was its unreliability. To-day the reliability of electrical plant was scarcely even questioned, although there was still diversity of opinion as to its safety. It lay very largely with members of their Association not only to prove that it was safe, but to make it so. Many accidents attributed to the use of electricity were due rather to the use of defective or unsuitable apparatus. So far as the surface was concerned, there was no question as to the safety of electrical apparatus; the principal risk lay underground, but if full advantage was taken of modern methods this risk could be greatly minimised, if not wholly obviated. In many mines there were places where, due to the continuous presence of gas, electrical apparatus ought not to be installed, and there were other places where, though normally gas was not present, at any time gas might be found. It was for the colliery managers and their advisers to put into such places electrical apparatus which was not only safe in normal circumstances, but also under these abnormal conditions.

Turning to the question of economy, he said that increasing attention was being paid to savings in the cost of fuel used for power purposes which could be effected by the use of by-products. When low-pressure steam turbines were driven from the exhaust steam of winding engines, the saving in steam consumption due to condensing alone could be taken as 25 per cent., and by utilising the steam for power generation 45 per cent., or more than sufficient to pay for the extra capital involved in the turbines. There were also enormous gains in the power transmission efficiency as compared with steam pipes, and both capital cost and maintenance expenses for electrical plant were lower than for an equivalent steam system, and on the score of efficiency alone the use of the electric motor was justified. In an existing plant, a reduction in the boilers of 40 per cent. might be made by the utilisation of the exhaust steam, or a saving in annual expenses sufficient not only to provide interest and depreciation on the plant scrapped, but to provide interest and depreciation on the electrical plant, and leave a profit as well.

### ELECTRICITY IN MINES IN NEW SOUTH WALES

THE annual report of the Department of Mines of New South Wales for 1918 contains various references to electrical mining work. The Electrical Inspector, Mr. H. G. Carter, reports that during the year no electrical accidents of any kind have been reported. "The use of electricity," he continues, "in and about the mines has greatly increased, and its usefulness as a means of obtaining motor power is being more appreciated. This increase has chiefly taken the form of sub-haulage gears, pumps, and coal-cutting machinery. A large central power station has been erected at Richmond Main Colliery, part of the plant being now in operation for driving the main ventilating fan, air-compressors, and haulages at Pelaw Main and the main winding engine at Richmond Main. Other large power stations are being built at Stanford

Merthyr and North Bulli Collieries, high-tension three-phase transmission being used in both cases to supply underground sub-stations. The advantages of using high-tension three-phase current is becoming generally recognised, and quite a number of mines, which previously employed low-tension current, have changed to this system. It is very satisfactory to note that the general condition of the electrical equipments throughout the mines is good. The colliery managers have shown themselves willing to keep their installations in strict conformity with the electrical special rules, and the mine electricians are also becoming more experienced."

A very thorough system of inspection seems to be in force, and all mines employing electrically-driven coal-cutters have to be inspected quarterly. During the year, 10 candidates out of 15 passed the examination for the certificate of competency as mine electricians, bringing the total number on the register up to 81. In the examinations for electric motor drivers, 78 candidates passed out of 106. The extent to which electricity is employed in New South Wales coal mines may be gathered from the following figures, which are computed from a table given in the report:—Out of a total of forty-eight collieries all except three are electrically equipped. Their generating plant aggregates about 8,780 kw., the individual plants ranging up to 890 kw. and being mostly under 500 kw. Alternating current exclusively is employed at only two mines, both A.C. and D.C. at twelve, and D.C. only at the remainder. One hundred and fifty-four electric coal-cutters are in use, and 59 haulages, 100 pumps, and 35 fans are electrically driven. Eighty-five motors are also used for other purposes. There is a considerable amount of electric lighting, both underground and on the surface. Electric signalling is used at forty-five mines, and telephones at the same number. Electric safety lamps have not yet come into use, but several companies have already ordered considerable numbers, and the inspectors are favouring their employment.

Electrical methods for the reduction of metals are used by the Electrolytic Refining and Melting Co. of Australia, Ltd., at their works at Port Rembla, and during the year £552,884 of gold, £45,788 of silver, and £944,160 of copper. The amount of copper is stated to be less than that for the previous year, on account of foreign competition.

**Electric Steel for the Allies.**—*The Iron and Coal Trades Review* reports that the Cie. des Forges et Aciéries Électriques, at Ugine, is working its large electric furnace plant day and night for the production of special steels for the French army and navy. The latest addition to the equipment is a Girod furnace capable of melting up to 25 tons of cold charges of scrap iron and steel. The plant has been remodelled and now contains two Girod electric furnaces of 2½ tons capacity each, two Girod furnaces of 10 to 12 tons capacity each, and one furnace with a capacity up to 25 tons of cold charge. A separate plant in the same town produces ferro-alloys by means of the electric furnace.

**Armoured Cables in Haulage Roads.**—At Hamilton recently, the Shotts Iron Company and some of its officials were prosecuted for failing to have certain cables along a haulage road protected by a metallic covering. It appeared that the cables were originally put in before the date when the new Regulations came into force in another part of the mine, being thus exempt from the regulation, but had lately been moved to the haulage road. The question was whether, owing to this removal, they were to be classed as new work, and not still entitled to exemption. The Sheriff held that this was so, and inflicted a nominal fine of £1 on the company, dismissing the charges against the officials.

**West of Scotland Branch of the Association of Mining Electrical Engineers.**—The opening meeting of the session was held on Oct. 19th at Glasgow, when Mr. A. B. Muirhead, branch president, gave his inaugural address, dealing with the maintenance of electrical plant in mines and the great improvement there had been from an engineering point of view in mining plant. Prizes were given to Mr. J. R. C. Kidler and J. A. Kerr for papers read by them last session.

**The Association of Mining Electrical Engineers.**—At a joint meeting of the Scottish branches of the Association of Mining Electrical Engineers and the National Association of Colliery Managers, Mr. Bowman (Uddingston) will read a paper on "Electricity at the Coal Face."



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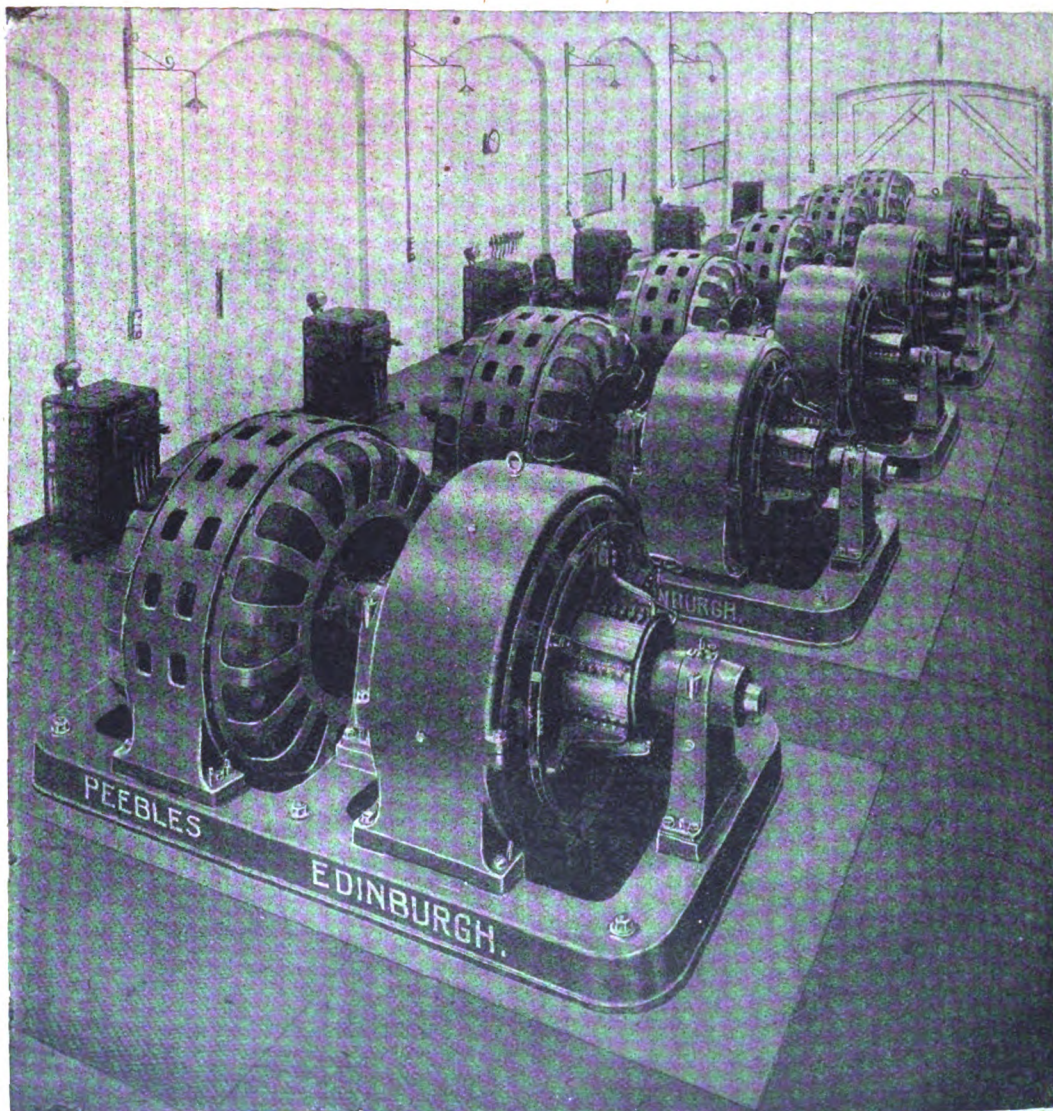
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## POWER FACTOR AND ITS IMPROVEMENT

A T a recent branch meeting of the Association of Mining Electrical Engineers, a Paper on the above subject by Mr. L. G. F. Routledge, of the Notts and Derby Branch, has been read and discussed. The Author said the matter was of growing importance with the increase of three-phase working in mines, and explained how the power-factor of the system was made worse by the employment of arc lamps and small lighting transformers, power transformers when lightly loaded, and induction motors. The effects of low power-factor were: Limitation of plant capacity and high capital costs; excessive losses and low efficiency of generators; consequent decreased efficiency of prime movers; excessive line, transformer, and distribution losses; consequent abnormal temperature rise everywhere; excessive voltage drop; bad regulation of generator and transformer voltage; possible continuous overloading of exciters; abnormal conditions in the operation of switchgear; errors in instruments, more especially energy meters. To meet these it was sometimes necessary to increase the k.v.a. capacity of the generators and transformers, and of the transmission and distribution systems. A possible way of reducing power-factor that might be applicable in certain circumstances was the series system of the British Electric Transformer Co. (see ELECTRICAL ENGINEERING, Vol. III., p. 197, Feb. 6th, 1908), in which a small transformer automatically replaces the full-sized one at times of light load. The use of synchronous and rotary-converters was also discussed as a remedy for low power-factor; the former could be adopted whenever a D.C. supply could be used for auxiliary purposes, and among mining purposes, where synchronous motors could be employed, were on endless rope continuously-running haulages, and pumps in the intake. Mr. Burnand had proposed a transformer device with small motor consisting of a transformer with tapplings arranged to supply different voltages to the motor, according to the load. This depends for its success on the fact that an efficient transformer had a smaller loss than the reduction effected in the motor losses.

The Miles-Walker phase advancer (ELECTRICAL ENGINEERING, Vol. IX., p. 31, Jan. 16th, 1913), the Brown-Boveri phase advancer, and the Kapp vibrator (ELECTRICAL ENGINEERING, Vol. IX., p. 239, May 1st, 1913), were also described in the Paper, and several colliery installations where the first two were at work were mentioned. It was also pointed out that an improvement in power-factor could be obtained if three-phase commutator motors were substituted for induction motors. The last method to be dealt with was the use of static condensers either of the Moscicki or Helsby types. An 864 m.f. condenser has been put in at Eastwood Colliery for this purpose. The author considered it likely that in the future, as experience proves the reliability of this apparatus, the advantages of relative cheapness and small attendance required will lead to the increased adoption of the condenser. He mentioned that at the present time the British Insulated & Helsby Cables, Ltd., were experimenting with a much improved pattern of condenser with a new dielectric. It seemed, however, that the largest improvements of power-factor from a commercial point of view were to be obtained, where motors above 130 or 140 h.p. were in operation, by connecting phase advancers or vibrators to the rotor circuits. If all the motors in use were smaller than this size, the static condenser seemed to hold the field entirely, owing to the way it might be sub-divided, and units of quite small capacity attached to different parts of the circuit.

**Electric Miners' Lamps.**—At a meeting recently of the Midland Institute of Mining, Civil and Mechanical Engineers, at Leeds. Mr. E. A. Hailwood, in a Paper on Electric Miners' Lamps, compared with oil lamps, gave results of experiments, showing that it was quite possible to produce ignition of gas by breaking the lamp bulb when alight, thus demonstrating the necessity for adequate mechanical protection and enclosure of the lamp bulb. He also referred to the advantage of the flame lamp in being its own gas indicator, and complained that in many electric lamps the actual candle power was considerably below that specified. As Mr. Hailwood's remarks formed to a considerable extent a defence of the oil lamp against the electric lamp, the matter was taken up strongly in a letter from Mr. S. A. Rybert in the *Colliery Guardian*, who points out that the danger from damaged flame lamps is much greater than from damaged electric lamps, many of which automatically cut the current off from the lamp on breakage of the outer glass. The light, he says, from electric lamps, even if it sometimes falls from the specified value, is still considerably greater than that of oil lamps.

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## AN ELECTRICAL GAS DETECTOR

**A**N improved form of electrical gas detector for mines, which is the result of considerable experimenting with older types, was described by Mr. G. J. Ralph in a Paper recently read before the North of England Institute of Mining and Mechanical Engineers. The instrument depends on the comparison of the resistances of a sensitive catalytic wire exposed to the atmosphere and a similar sealed-up wire. The absorption of combustible gas by the catalytic wire raises its temperature, and a corresponding increase of resistance is produced, which, by proper calibration, can be made a measure of the proportion of inflammable gas present. The two wires are contained in the arms of a Wheatstone bridge, and a slide wire in dial form enables a direct reading to be made after setting a pointer to produce no deflection on a zero galvanometer which forms part of the apparatus. Current is supplied either from a separate 4-volt battery or from the battery of a miners' lamp with special plug connections. The instrument, with its galvanometer, resistances, pointer and dial, &c., is strongly and compactly made, and is of smaller size than the ordinary electric miners' lamp.

## ELECTRICAL WORKING OF COLLIERIES

**I**N the course of his Presidential Address to the North Staffordshire Institute of Mining and Mechanical Engineers at Stoke, on Oct. 26th, Mr. J. Gregory, referring to the growth of electrical working in mines, said that only a few years ago an engineer who suggested the employment of electric motors in place of steam winding engines would have been scoffed at, and yet to-day, in spite of an enormous increase of depth and load, there were few instances where, in laying out a new colliery, a considerable advantage could not be obtained by their use. The length of time occupied in a single wind was so short that the utmost attention had to be devoted to the periods of acceleration and deceleration, and it was here that the electric motor scored. A great advantage lay in the even turning moment of the motor, which, especially in the case of deep shafts, contributed to the steadiness of the winding rope. Many collieries now took the whole of their power from large power supply companies, and in some cases an advantageous arrangement had been entered into whereby current could either be taken from or delivered to the company, according to the state of the load. It was particularly in the case of new collieries that electrification showed its advantages. Where steam winding was employed, exhaust and mixed pressure turbines enabled a serious wastage of power to be checked. As regards electric power for purposes other than winding, motors aggregating 16,000 h.p. were in use in the North Staffordshire Collieries alone. The advantage of centralised power supply was further emphasised in seconding the vote of thanks by Mr. Hassam, who regretted that there was no large power supply system to draw upon in their district. He mentioned a case of a colliery which would probably have adopted electrical working throughout if such a supply had been available, but where the directors did not consider that a separate generating plant would pay.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

### QUESTION No. 1,415.

The querist is interested in the running of rotary converters, and would like to hear of the experiences of station engineers with regard to the behaviour of the A.C. brushes and slip rings.

In the last year or two the tendency has been to use brushes of a metal-carbon mixture in preference to the copper-leaf brushes invariably fitted to the earlier machines. Some of these earlier machines, if not most, ran for many years before renewal of the slip-rings became advisable, but the writer has known of several machines, using composite brushes, where the wear has become a serious matter. It would be interesting to hear the opinions of engineers with both types.

The trouble, if it is general, may not be due to the material of the brushes, as excessive current density may count for a great deal, but there may be something in it, as the writer believes that there are one or two corporations who insist on having copper-leaf brushes. A. G. T. C.

(Answers must be received not later than first post Thursday, Nov. 12th.)

### ANSWERS TO No. 1,412.

A consumer, without notifying the supply authority, increases his load so that for one or two hours every day the load exceeds by 50 per cent. the rating of his meter. What will be the effect of such a procedure on the chief patterns of meter on the market, and what indication will the supply authority have that this has been done? It is of course assumed that the main fuses have not blown.

The first award (10s.) is given to "OHM" for the following reply:—

It is not stated in the question whether the supply is alternating or direct current, but in either case a well-designed meter which is calibrated to read correctly at full normal load will register less than it should do on a 50 per cent. overload to the extent of from  $1\frac{1}{2}$  per cent. to 3 per cent. In certain cases the error may even be greater than 3 per cent., but as a general rule the meter will *always run slow on the overload*, and if the particular meter in question be one of repute, the error will lie between the limits given above. No permanent injury to the working parts, or effect on the accuracy, will result from the overload, which is only maintained for a comparatively short period; and after the normal load is again restored there will be nothing whatever to indicate to the supply authority that the consumer has been surreptitiously overloading his meter, other than, of course, the abnormal registration of the meter dial. The only possible way, therefore, of detecting the overload is for the supply authority to connect in series with the meter a maximum demand indicator which will give a permanent record of the maximum load reached during any given period. In connection with this matter it should not be overlooked, however, that the value of the load on the meter at any given time can be readily calculated from the speed of the meter armature. The speed can be easily determined by counting the number of revolutions made in a given period of time, using a stop-watch.

The second award (5s.) is given to "ASTATIC," whose reply is given in somewhat shortened form below:—

The majority of meters fitted by supply companies are fairly accurate from  $1/20$ th of full load to 20 per cent. overload, and after this they commence to register slow, which is, of course, in the consumers' favour.

The reason for this depends upon the type of meter being used, so, as an example, we will discuss a Chamberlain and Hookham meter for direct currents with a 10-ampere rating, as this type of meter is extensively used. This meter is an ampere-hour meter of the mercury motor type. The current is led to and from the meter by two copper strips placed in a mercury bath, the bath being fixed in the field of a permanent magnet. Two discs are fitted on a spindle, the lower disc is immersed in the mercury, and the upper disc is free to rotate between the poles of a brake field, thus forming an eddy current brake. To overcome the fluid friction of the lower disc in the mercury, a correcting coil of a few turns of wire carrying the main current is wound round the brake field; from this it will be seen that as the load increases the brake field will become weaker, and the speed of the meter will increase. This is fairly accurate up to 20 per cent. overload, but as the fluid friction increases with the square of the speed, and the strength of the brake field is in proportion to the amount of current traversing the correcting coil, it will readily be seen that at 50 per cent. overload the meter must read slow, because the fluid friction is nearly twice what it was at full load. The supply company would have no indication that the load had been increased, unless a maximum demand indicator were fitted.

**Answer to No. 1413.**—"Koil" calls our attention to the fact that in his reply to this question, published on page 562 of our last week's issue, the formula for the number of armature bars at the beginning should have the speed given in revolutions per minute, instead of revolutions per second.

## FUTURE OF LONDON'S ELECTRICITY SUPPLY

THE Special Committee of the London County Council which has had in hand the question of London's future electricity supply has now somewhat elaborated its detailed proposals placed before the Council in July, and given in *ELECTRICAL ENGINEERING* for July 30th, p. 428. Briefly, the scheme is that an authority shall be constituted to develop a new undertaking dealing with the whole of the supply to London and a considerable area outside, the undertaking being subsequently leased to a company which is to provide part of the capital required for extensions. This leasing company is to work under the general control of the new authority under certain definite restrictions, including the limitation of dividends. The object of the present report, which was presented to the London County Council on Tuesday, was to recommend definitely that the Council should promote a Bill next session to give effect to the proposals.

Since the previous report, the opportunity has been taken by the Committee, as notified in our columns, of meeting representatives both of the London boroughs owning electricity works, and of the municipalities similarly situated in the Greater London area, affected by the proposed scheme, and it is probably as a result of these conferences that the Special Committee deals first with suggestions that the present is not the most opportune time for dealing with this matter. On this point the Committee at once definitely expresses itself satisfied that the scheme constitutes the most practicable method of arriving at a satisfactory solution of the problem, and that the exceptional conditions which obtain do not affect adversely the advantages of the scheme presented. Furthermore, it is pointed out that full liberty of action will be left to the Council in dealing with the matter after the Parliamentary powers have been obtained, as the Bill asks for a time-limit of five years, and expenditure under the Bill would not, of course, be sanctioned unless the conditions were favourable.

The details of the scheme which the Committee ask the Council to place before Parliament follow practically without modification the outline given in our issue for July 30th. The most important modification, perhaps, is that whereas originally it was suggested that the proposed new company should find one-third of the capital required for new works, and the new Authority the other two-thirds, it is now asked that the extent to which either party should participate in the financial responsibility shall be left to agreement according to circumstances.

It is proposed to insert in the Bill clauses for the protection of consumers through the medium of a scale of maximum charges which can be revised by the Board of Trade from time to time upon the application of either the Authority or the company. In addition, power is to be given to the Authority to take action generally for the protection of the interests of retail and bulk consumers. In order to enable the Authority to exercise an effective watch over the interests of the consumers it is proposed that it should be vested with the general powers relating to electricity supply which are now vested in the County Council, and in the local authorities outside the County area. With regard to relations between the existing undertakings, the Bill will provide for the Authority to advance them money to enable them to take bulk supply, lay down standard networks, &c., and, in order to secure some degree of continuous co-operation and inter-working, certain general powers of approval in regard to extensions of existing undertakings are to be conferred upon the Authority subject to appeal to the Board of Trade. Further, Local Authorities who are authorised distributors in the area are to be required to take any additional power required by them from the new undertaking, provided it is shown to the satisfaction of the Board of Trade that it would be more profitable to do so than to extend their own plant. The only compulsory powers which it is proposed to confer upon the new Authority are, it is pointed out, designed to prevent individual supply authorities from incurring capital expenditure in laying down plant and other works which, in the opinion of the Board of Trade, are definitely unsuitable to an ultimate scheme of uniformity of supply throughout the Greater London area.

The Finance Committee of the County Council supports the proposal, and foresees by its adoption a diminution in the difficulties attending the extension of a number of comparatively small, and in some cases unprofitable concerns, and at the same time the avoidance of claims for severance which would undoubtedly arise in the event of the Council purchasing the companies' undertakings in the County of London only under the existing powers. The Finance Committee points out that the estimates show a capital total

expenditure of about £5,000,000 for the first period of five years, and further sums subsequently at the rate of about £1,000,000 per annum. As, however, five years are to be asked for after the passing of the Act in which to bring the scheme into operation, it would be possible that, if the conditions were temporarily adverse, no heavy capital expenditure would be incurred until nearly 1920. Also, it is pointed out that if no company comes forward, the whole scheme drops. Finally, it is suggested that if during the early stages of the Parliamentary proceedings, which are estimated to cost about £17,000—should the scheme be finally passed—it is foreseen that there is little chance of carrying the matter to a successful issue, it would be the best policy not to continue with the promotion, and so save a considerable sum in Parliamentary expenses.

## LUNDBERGS' ELECTRIC-LIGHT SWITCHING COMPETITION

BY arrangement with Messrs. A. P. Lundberg & Sons, we are placing space in our next four issues at their disposal for the publication of the details of their new electric-light switching competition. These particulars will be published in *ELECTRICAL ENGINEERING* only.

The object of the competition is to extend the knowledge of the various methods of electric-light switching; in fact, the same object as the publication of the small book on this subject reviewed in our last issue.\* Competitors will, in fact, be assumed to have a more or less intimate knowledge of the contents of this book. Three sets of question papers will be set: preliminary, intermediate, and advanced; competitors are invited to select one of these three, and a date will be fixed for answers to be sent in to this office. First and second prizes (in money) will be awarded in each of the three grades, and certificates will be issued to all competitors whose efforts show a proper acquaintance with the subject. Messrs. A. P. Lundberg & Sons have appointed Mr. W. Perren Maycock, the author of the book referred to above, to examine the papers.

The competition is open to all of our readers, whatever their status, and it may be cordially recommended to them. No fee is required, and all that it is necessary to do is to read the book upon which the competition is based, to read the rules of the competition in our next issue and the question papers in the next three issues, and to send in answers to one set of these. The answers can be worked at home with the help of the booklet. There are no troublesome "coupons" to fill in, and the competition is as open to those who commence reading *ELECTRICAL ENGINEERING* today as to those who have read it for seven years. Another point that will appeal to many of our readers is that competitors will be free to enter the competition under a *nom-de-plume*, so long as they send their name and address as a guarantee of good faith. In the last electric-light switching competition held by Messrs. A. P. Lundberg & Sons, competitors included members of the Illuminating Engineering Society, associate members, graduates, and students of the Institution of Electrical Engineers, as well as contractors, foremen, and wiremen. They hailed from all parts of the United Kingdom:—from Dublin to Clacton and from Glasgow to Southampton, and some wrote from Ceylon, Barbados, Chili, South Africa, and India.

The preliminary grade questions will deal with the connection of the simpler circuits, and the switches and other accessories used therein. The intermediate grade paper involves a more intimate acquaintance with all except the most complicated switching circuits and a certain amount of deductive work on the part of the competitor in working out problems that are not immediately obvious. The advanced grade paper calls

\* *Electric Lighting Connections*. Third Edition (25th thousand). Obtainable from the Kilowatt Publishing Co., Ltd., 203, Temple Chambers, London, E.C., Post Free 7d.

for a wider and more general appreciation of the whole details of the subject than the preliminary and intermediate papers, and competitors may be asked to devise additional modifications, to sketch new diagrams and to work out new arrangements of circuits for special cases.

Quite apart from the desire to gain prizes, many will find it both interesting and instructive to work out the problems given in the papers. It is always satisfactory to feel that one has solved a "knotty" problem not immediately obvious, especially if in doing so information may be acquired which has not been hitherto possessed. An engineer or contractor who has studied the papers sufficiently to be able to answer all the questions will feel in a position to tackle the most troublesome problem as to the arrangements of lights and switching which the most exacting client may wish to impose on him; and the wireman who has competed with success will undoubtedly be able to class himself among those who possess technical knowledge as well as mechanical aptitude, so that he may advance rapidly to the best jobs and the best positions.

It may be said with truth that the subject of Electric-Light Switching is really a very important branch of electrical work, the scope and possibilities of which will greatly surprise those who investigate the subject for the first time.

## POWER RATES AND 'UNDUE PREFERENCE'

A DECISION given in the Court of Appeal last Thursday should put central station engineers and managers on their guard when framing tariffs for electricity supply. It should be recognised that the sole justification for differential tariffs is to permit of the charge for supply being varied approximately as the cost of the supply to the undertaking.

The appeal in question was against a decision given by Mr. Justice Sargant last May in the case of the Attorney-General, at the instance of the Long Eaton Gas Co. v. the Long Eaton Urban District Council (ELECTRICAL ENGINEERING, May 14, p. 266). In September, 1911, the Electricity Department of the Long Eaton U.D.C. issued a circular limiting the benefit of the cheapest rates for power (3d. per unit for all consumption over 6,000 units per quarter) to those consumers who took current for all their lighting as well as for power. For consumers taking electric power only, and not using electric light to the exclusion of other methods of illumination, the sliding scale of charges stopped at 1d. per unit for all units above 4,000 per quarter.

This, it was alleged, constituted an infringement of Sections 19 and 20 of the Electric Lighting Act of 1882, which read as follows:—

19. *Obligation on Undertakers to Supply Electricity.*—Where a supply of electricity is provided in any part of an area for private purposes, then, except in so far as is otherwise provided by the terms of the licence, order, or special Act authorising such supply, every company or person within that part of the area shall, on application, be entitled to a supply on the same terms on which any other company or person in such part of the area is entitled, under similar circumstances, to a corresponding supply.

20. *Charges for Electricity.*—The undertakers shall not, in making any agreements for a supply of electricity, show any undue preference to any local authority, company, or person, but, save as aforesaid, they may make such charges for the supply of electricity as may be agreed upon, not exceeding the limits of price imposed by or in pursuance of the licence, order, or special Act authorising them to supply electricity.

Mr. Justice Sargant had given his decision against the Long Eaton Council.

Before the Appeal Court, Mr. Vesey Knox, K.C. (who appeared for the Urban District Council, with Mr. Martelli, K.C., and Mr. Courthope Munroe, K.C.), argued that Mr. Justice Sargant was wrong in practically ruling out of consideration, in the arrangement of a tariff, the element of competition. The Court, however, which consisted of the Master of the Rolls and Lords Justice Kennedy and Swinfen-Eady, held that this was not a material point, and that the Council was called upon to justify the circular. Lord Justice Kennedy remarking that if this was not undue preference, he did not know what was. Lord Justice Swinfen-Eady put the case of two factories both taking the same quantity of energy for lighting and power under

identical conditions, but one, in addition, having either a gas engine or a few gas burners. Why should the latter one not have the same terms as the former? Mr. Martelli further argued that the Act of Parliament was intended to restrain a supply authority from doing a certain thing, and not to restrain it from threatening to do it, and pointed out that the circular had never been acted upon. The Court ruled, however, that, as the circular had not been withdrawn, the judgment of Mr. Justice Sargant must stand, and dismissed the appeal with costs. They regarded it as fairly obvious that the differentiation of charges in question was in contravention of the Electric Lighting Acts, and displayed considerable impatience at the length of Counsel's arguments, the greater part of which they characterised as irrelevant.

We cannot help feeling that no good has been done to the electricity supply industry by bringing the matter to the Court of Appeal, and, in fact, several of the leading men in municipal electrical circles have expressed to us the opinion, which we fully share, that the Long Eaton Urban District Council should have withdrawn the offending circular at the outset, and should never have allowed the case to be brought into Court at all.

## ROYAL NAVAL DIVISION

THE detachment which the Institutions of Electrical, Civil, and Mechanical Engineers were asked to provide for the Royal Naval Division is now complete, and no further men are required. We give below the names of the members of the Institution of Electrical Engineers who have been allocated to the Signal Company which is commanded by Capt. G. H. Spittle, A.M.I.E.E., and Lieut. H. Dobell, A.M.I.E.E.:—

*Member.*—A. E. Loos.

*Associate Members.*—G. C. Allingham, A. Arden, S. P. Barnes, L. C. P. Bellamy, C. Bollam, G. F. Boxall, W. B. Boyd, C. A. Brearly, H. A. Brimelow, W. J. I. Casewell, J. F. Clunas, H. A. Edger, E. A. Edwards, E. P. Elwin, S. K. Ferrier, E. F. French, J. W. Griggs, E. J. Harper, D. Harrop, R. P. Hulton, E. W. Kay, J. H. Murray, H. H. Pearson, P. C. Pocock, W. R. W. Poole, L. H. Pratt, A. H. Read, T. N. Riley, B. H. Smith, H. A. Tulloch, A. G. Watson, W. Whitney, G. E. E. Williamson, A. C. Wilmot, and A. E. G. Wood.

*Associates.*—A. L. Annison.

*Graduates.*—H. J. Booth, C. A. Grut, T. J. Hornblower, C. E. Monks, G. Ollier, F. C. Platt, W. G. Stokes, E. Wyatt.

*Students.*—G. G. Baker, F. L. Ballard, A. Bannister, E. Barlow, L. W. E. Baxendale, E. J. Billington, B. L. Bishop, H. Booker, C. W. Bostock, C. W. Boxall, A. S. Bruce, J. H. Burchett, A. S. Carr, R. M. Clark, J. P. Clifton, H. H. Curtis, E. A. Deacon, J. A. Donald, M. O. F. England, E. A. Gordon, E. F. James, B. H. Leeson, C. E. Maguire, R. O. Martin, B. E. G. Mittel, E. L. Morgan, P. Morrell, A. H. Ogden, J. Page, J. D. Peattie, A. C. Roberts, J. N. Robertson, E. J. Shuter, E. Simkiss, W. G. Spencer, C. A. Stephens, H. J. Stone, H. C. Vereker, C. S. Williams, P. Wrigley, W. Young, and H. S. Housden.

In addition the Signal Company also contains four Associate Members and eight Students of the Institution of Civil Engineers, and seven Associate Members and three Graduates of the Institution of Mechanical Engineers.

**Temporary Commissions in the Royal Garrison Artillery.**—The Institution of Electrical Engineers has been asked to submit names of suitable members for temporary Commissions in the Royal Garrison Artillery. Candidates should be well educated, between the ages of twenty and thirty, and with practical mechanical as well as electrical training. Specially good officers are required. Applications should be sent on a foolscap sheet of paper to the President, Sir John Snell, stating age, nationality, whether single or married, and details of education, mechanical and electrical training, and military experience, if any.

**The Ilford Case.**—We understand that the main point to be fought in the action by the Ilford Gas Co. against the Ilford Corporation is as to preferential charging to consumers whose premises are lighted entirely by electricity. The Gas Co. also made a charge as to dealing in fittings without powers, but apparently the Council has consented not to continue to do this. The I.M.E.E. has circularised its members as to their willingness to give financial assistance in fighting the case. The Salford Corporation has referred back to the Electricity Committee a proposal to contribute £20, and the Town Clerk has been asked to prepare a report on the matter. The short facts of the case were given on p. 400 of our issue of July 9th.

**Municipal Wiring.**—The Incorporated Municipal Electrical Association is inquiring as to the extent to which its members would contribute towards the cost of promoting a bill for conferring hiring and wiring powers upon those local authorities desiring them. The possibility of promoting such a joint bill was suggested at the annual convention in Birmingham this year.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Some doubt exists as to what will be the position of the English staff of the Constantinople Co., now that war with Turkey has broken out. It has been taking from ten to fourteen days to obtain news from Constantinople, and the last reports received by the Company over here from their staff date back about three weeks. Evidently there had been reason to expect trouble long before that, for about six weeks ago an order was given that all the wives and children of the English staff were to be sent home, and, as a matter of fact, they arrived here about a month ago. There had been financial trouble as well, and a money famine, but it may be inferred that the trouble anticipated was not on this account alone. The telephone service has been going on quite well, and, in fact, at the time of the last report, new lines were being put up by the Company. The work of the con-

tractors in carrying out additions to the exchange, &c., was, however, completely stopped owing to shipping having ceased. In any case it would have been hopeless to have tried to get material out, as practically all that was required was regarded as contraband of war. The operating staff of the exchange is all Turkish, but the Traffic Manager, Miss Minter, who is still in Constantinople, is an Englishwoman, and of course the greater number of the Company's officials on the engineering side are also English, and include a number of former employees of the National Telephone Company.

The Turkish lines crossing the Russian frontier are down, but the Eastern Telegraph Co. deny that the cables between Tenedos-Syra and Tchesme-Syra are interrupted.—The Constantinople-Odessa cable is interrupted.—Communication to S. Domingo is restored *via* "Key West-Jamaica," but telegrams to places beyond La Romana will be probably sent by post.—The Peruvian Administration will only accept messages in plain Spanish, English, and French for wireless stations at Masisea, Orellana, Requena, Itaya, and Iquitos, and the use of cipher is prohibited.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Oct. 29th, 1914

A full list of those of electrical interest among these was published in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of invention; from abroad.

19,919/13. **Current Transformers.** F. COATES, J. MIRREY and A. REYROLLE & Co., LTD. Current transformers for actuating Merz-Price protective gear with one primary turn and a core made up in sections with air gaps between them. (Six figures.)

21,672/13. **Wireless Telegraphy.** MARCONI'S WIRELESS TELEGRAPH Co. and R. N. VVYAN. A method of connecting up condensers into a bank, which ensures that the oscillation constants of all the units are practically the same. (Two figures.)

22,406/13. **Telephones.** WESTERN ELECTRIC Co., G. H. NASH and B. B. GRACE. Details of construction of hand combination telephone sets with stamped metal bodies. (Four figures.)

22,416/13. **Water Heaters.** A. F. BERRY. A system of electric water heating with one or more heating chambers communicating with a central storage vessel arranged so that the latter can easily be inspected and cleaned out without disturbing the supply of water from the heating vessels. Contacts controlling the heating circuit are interlocked with the draw-off cock of the storage tank, so that it cannot be cleaned out or inspected until the current is cut off. The heating elements are easily replaced, and the heating vessels are easily detached from the storage vessel. (Three figures.)

24,688/13. **Demagnetising Switches.** T. L. JONES. Switches for demagnetising the material held by magnetic clutches by the method of continued reversals, consisting of a double multiple contact rheostat with stops connected alternately to points on resistances in both sides of the circuit and two contact arms connected to the clutch coil. As these travel over the contacts the current is reversed and diminished at each step. (One figure.)

25,607/13. **Storage Battery Plates.** E. H. NAYLOR. Battery plates made of three superposed grids fixed together with the outer ones filled with acting material and the centre one left unfilled and cut away at certain points, so as to allow of free circulation of the electrolyte. (Six figures.)

29,581/13. **Electric Bells.** W. J. BLENHEIM.—Large electric bells in which a heavy external hammer, after making and breaking contact in the usual way, is free to swing back any distance. During its return swing towards the bell, contact is again made and the stroke accelerated. (Five figures.)

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** TAYLOR [Frequency changing] 15,729/13; B.T.-H. Co. and WEDMORE [Leakage protection] 25,598/13.

**Dynamos, Motors and Transformers:** HEENAN & FROUDE, LTD., and WHEAL [Air filters] 23,281/13; FAYE HANSEN [Choking coils] 25,695/13; SIMMONS [Regulation of variable-speed alternators] 25,919/13; HALL and RILEY [Motor control] 16,319/14.

**Electrometallurgy and Electrochemistry:** WALTISPURGER and RIVOAL [Electroplating] 23,241/13; JENKINS, PATINSON, and WELLESLEY [Electrolytic cells] 25,415/13.

**Switchgear, Fuses and Fittings:** NORBALLE and LAWSON [Motor starters] 23,127/13; COLLINS and OPTALYTE, LTD. [Motor-car lamps] 23,543/13; BONNELLA and BONNELLA [Switches] 26,635/13; NORBALLE and LAWSON [Multiple contact switches] 17,988/13.

**Telephony and Telegraphy:** MARCONI'S WIRELESS TELEGRAPH Co., LTD., and FRANKLIN [High-frequency alternators] 23,557/13.

**Traction:** WILLS and SYKES [Insulated rail joints] 19,603/13.

**Miscellaneous:** HADDAN [Stewart-Warner Speedometer Corporation] [Magnetic speed indicators] 22,048/13; LANCASHIRE DYNAMO & MOTOR Co., McLEOD and WHITMORE [Crane brakes] 22,435/13; WESTERN ELECTRIC Co. [Woodward, W.E. Co., U.S.A.] [Welded contacts] 26,609/13; BERGTEIL [Oscillating electric fans] 29,449/13; WILLIAMS [Torches] 65/14; A. G. BROWN BOVERI ET CIE [Turbine regulation] 3,893/14; CASELLA [Electrode-making machines] 14,582/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Ignition:** BETHENOD [Magnetos] 15,576/14.

**Miscellaneous:** DONATH [Discharge tubes] 20,374/14; BRÜCK [Magnetic separators] 20,551/14.

### Applications for Suspension of Patent's

20,922/12, **Magnetic Clutches,** VULKAN MASCHINENFABRIKS A.G., and 23,150/12, **Switches for Magnetic Clutches,** E. C. R. MARKS [Vulkan Maschinenfabrik A.G.]. The application by Glenfield and Kennedy under these patents has been refused.

### Expiring and Expired Patents

The following Patent's expire during the current week, after a life of fourteen years:—

19,988/00. **Insulating Rail Joints.** W. R. SYKES, A. P. JOHNSON and C. J. COOKE. An insulating rail joint with the fish plates divided into two parts insulated from each other and held together by insulated bolts.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors, &c.:** LANCASHIRE DYNAMO & MOTOR Co. and R. S. McLEOD [Boosters] 15,811/03 and 14,495/04. **Ignition:** MARCONI'S WIRELESS TELEGRAPH Co., LTD., and PRIDDLE [Coils] 15,910/06.

**Incandescent Lamps:** SOC. FRANCAISE D'INCANDESCENCE PAR LE GAZ (SYSTEME AUER) [Manufacture and mounting of metal filaments] 12,720 & 24,211/08 and 11,149/09; C. TREZEN [Titanium filaments] 14,852/08.

**Telegraphy:** R. K. GRAY [Submarine cables] 15,054/08.

**Traction:** W. MORRISON [Petrol-electric vehicles] 16,331/09; DALZIEL'S CONSTANT VOLTAGE PATENTS, LTD., and J. DALZIEL [Train lighting] 16,645/09.

**Miscellaneous:** H. W. LAKE [Coal cutters] 16,323/07; ZHANIEL [Stage lighting effects by high-frequency currents] 16,309/09; F. BURKS [Electric massage apparatus] 16,405/09; A. G. KOEHLIN [Loom lighting] 22,125/09.



## "ELECTRICAL ENGINEERING" TRADE SECTION

### "MAGNET" ELECTRIC FIRES

SEVERAL new patterns of their "Magnet" electric fires have been introduced by the General Electric Co. (67 Queen Victoria Street, E.C.) since they first commenced the manufacture of these appliances last year. In addition to utilitarian patterns in polished brass and iron, a number of more ornamental designs have been prepared, such as

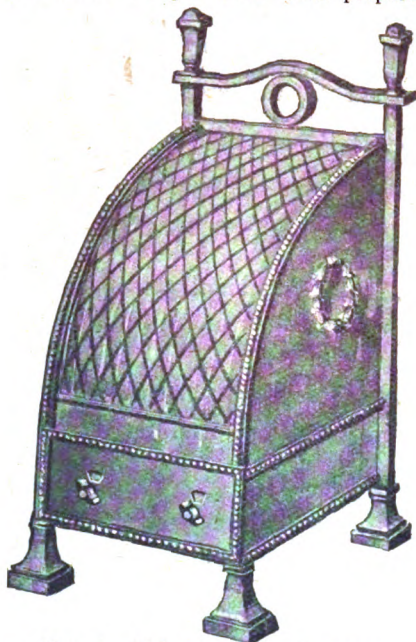


FIG. 1.—DRAWING-ROOM PATTERN.

that shown in Fig. 1. Another new design is the circular heater seen in Fig. 2 for clubs, hotels, &c. It will be remembered that the heating element consists of a number of wire coils laid in parallel slots in a grooved slab of fire-proof material, the whole face of which glows when the fire is on. Any coil can be very easily replaced, and, as they are



FIG. 2.—CIRCULAR CLUB AND HOTEL PATTERN.

in parallel, the burning-out of one does not affect the others, which are separated from one another by substantial insulating walls. Double break switches are used, completely isolating the elements, so that there is no risk of shock when replacing them. A substantial wire guard is placed over the elements, and other notable features include the use of a spiral form of terminal block, taking all strain off the conductors, and the provision made at the top of the fire for fixing a trivet by which water may be boiled or food kept hot.

### HALF-WATT MOTOR CAR LAMPS

THE announcement is made in a new leaflet issued by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), that Mazda half-watt lamps are now made at Rugby in sizes and special forms for motor-car head-lamps. The advantage of these lamps, in being twice as efficient as the ordinary metal-filament lamps now

in use, and about eight times as efficient as the old carbon lamps, is of great importance, and should lead to their extensive adoption. This new small half-watt lamp has the same leading characteristic as the large half-watt lamps in that a helical drawn-wire filament is used in a bulb contain-



HALF-WATT MOTOR-CAR LAMP (FULL SIZE).

ing an inert gas, which enables it to be run at a high temperature without blackening the bulb, as will be seen in the illustration. These lamps have the filaments arranged in a very compact form, so that they focus well in existing head-light mirrors, and are on the market in the following sizes:—20 and 32 c.p. for 6 volts; 32 c.p. for 8 volts; and 50 and 100 c.p. for 12 volts.

### A HALF-WATT STREET LANTERN

WITH the object of obtaining a maximum candle power between  $10^\circ$  and  $20^\circ$  below the horizontal, with a comparatively rapid falling away in candle power from this point towards the vertical and the horizontal, the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), have introduced the new patent street-lighting unit (Patent No. 21,485/12), shown in section in Fig. 1, and how well this object is attained is shown by the polar distribution curve in Fig. 2.

The lantern consists of heavy copper spinnings, secured to

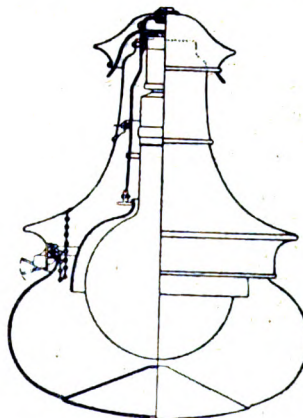


FIG. 1.

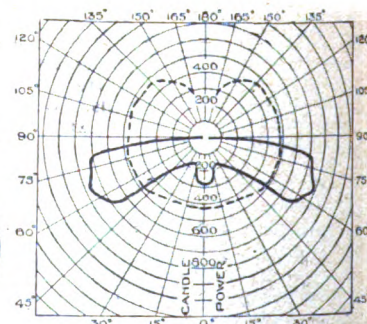


FIG. 2.

an internal mild steel spider, to which the lamp-holder is also attached. It is so arranged that by the removal of one nut the upper spinnings can be detached, giving free access to the holder, &c., for wiring. The spider also forms a gallery which holds the reflector in the correct position relative to the lamp. The globe is secured to a copper ring by means of clips held by screws, and this ring is secured

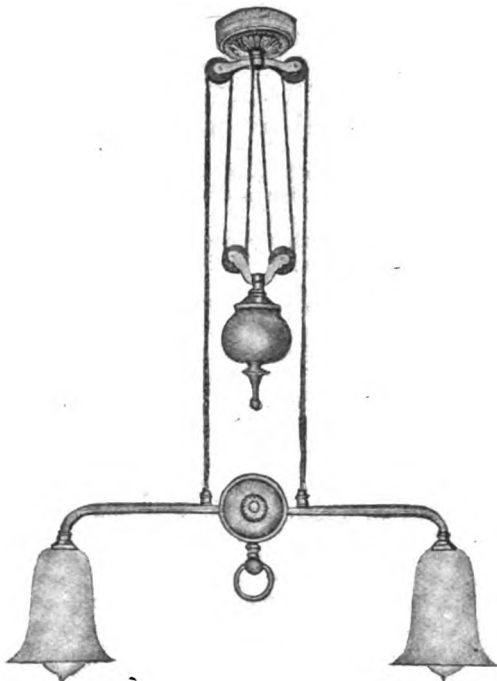


to the lantern frame by three spring latches, so that the globe may be easily removed or inserted, and at the same time is quite secure when in position. Owing to the special form of construction, whereby the top spinning can be removed when the lantern is in position (either on a chain or attached to a bracket), easy access is gained to the interior for wiring. When not connected to a rigid tube it is intended that the leads should be carried in beneath the detachable spinning, which obviates the necessity of employing a weatherproof hood with the attendant difficulties of wiring, &c. The unit embodies an upper reflector and a lower deflector, to catch the excess rays which would fall within a zone of  $0^{\circ}$  to  $50^{\circ}$  and turn them into a direction of about  $15^{\circ}$  to the horizontal.

The standard finish of the lantern is black stove enamel, but other coloured enamels or polished copper finish can be supplied at slight extra cost over list price.

### DIMMER FITTINGS

A NOVELTY has been introduced by Simplex Conduits, Ltd. (Garrison Lane, Birmingham), in the shape of a two-light pendant fitting illustrated here, which is provided with a series parallel switch in the body of the fitting, by which



BEDROOM DIMMER FITTING.

one or both of the lamps can be turned on full or both turned on dim by putting them in series. This should be very useful in bedrooms and other situations. A two-light wall bracket on a similar principle is also supplied.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**METAL FILAMENT LAMPS.**—A well-arranged new price-list of Royal Ediswan drawn-wire tungsten filament lamps has been issued by the Edison & Swan United Electric Light Co., Ltd. (Ponders End and 123 and 125 Queen Victoria Street, E.C.). In addition to the ordinary standard lamps, a number of candle, tubular, and other special designs are listed. The list also contains full particulars of the "Downlight" lamps with helical filaments, and last, but not least, the Ediswan half-watt lamp.

**AUTOMATIC ELECTRIC LIGHTING PLANT.**—The "Lister-Bruston" system of automatic control of small generating sets driven by petrol or gas engines is described in an interesting pamphlet from R. A. Lister & Co., Ltd., Dursley. In this system the engine is started up when required by the dynamo acting as a motor taking current from the battery as soon as either the load exceeds a certain amount or the battery voltage drops below a certain amount, and stopped when these conditions are reversed. This is accomplished by suitable relays acting on a solenoid-type automatic starter. Thus not only is attendance to a large extent dispensed with, but the battery is charged exactly when required. Views are given of a number of houses where the plant is in use, and testimonials bear witness to its

reliability in action. The system has lately been installed at St. Mary's Convalescent Home, Clevedon, which was formerly lighted by gas. The gas is now used to drive the engine, and the gas consumption has been reduced by more than one half.

### THE ENEMY'S TRADE

THE Incorporated Municipal Electrical Association has communicated with the municipal electrical undertakings of the country offering assistance in endeavouring to arrange for better supplies in this country of goods hitherto obtained from Germany and Austria. In this way it is hoped to obtain information which may lead to co-operative purchasing, and so secure better terms, or which may enable the Association to indicate the magnitude of the demand and encourage British firms to take up manufacture.

In connection with the campaign undertaken by the Board of Trade to assist British manufacturers and merchants to secure trade formerly in the hands of German or Austro-Hungarian firms, the Board have received a large number of inquiries for names of sellers or buyers of articles of which the sources of supply or markets have been interfered with by the war. Special arrangements have been made for dealing with the inquiries, and lists are being prepared and circulated of articles which inquirers desire (a) to purchase, and (b) to sell. The third list, in which is incorporated the first and second lists, was published on Oct. 14th; the fourth list, which is a supplement to the third list, is now ready, and may be obtained, together with copies of the third list, on application to the Branch. Firms interested in any of the goods mentioned, either as buyers or sellers, should communicate with the Director of the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, London, E.C.

The new list of articles which inquirers desire to purchase includes:—Bioscopes and accessories, porcelain and other insulators, pocket lamps and cases, lenses and batteries therefor, arc lamp carbons, conduits and fittings, commutator segments, dry cells, magnetos, insulating links for switches, Nernst glowers, steatite, lamp bulbs, miner's lamp dome glasses, arc lamp globes, metal filament lamps, motor-car lamps, lamp caps, and mica. The list of articles which inquirers desire to sell includes electrical apparatus generally, and in particular fittings and tungsten. The goods in respect of which names have been received of firms abroad open to purchase include telephone cables, arc lamp carbons, bells and pushes, cables, D.C. dynamos, fittings, incandescent lamps, pocket lamps, Roentgen ray bulbs, and telegraph apparatus and supplies.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Atherton.**—One 250-kw. single-phase transformer. Borough Electrical Engineer. Nov. 18th.

**Blackpool.**—One 1,500-kw. turbo-alternator, water-tube boiler, &c. Borough Electrical Engineer. Nov. 19th.

**Croydon.**—Electrical pumping plant at sewage disposal works. Town Clerk. Nov. 17th.

**Finchley.**—A number of mains extensions are to be carried out at an estimated cost of about £200.

**Russia.**—In a report from H.M. Consul-General at Moscow, it is stated that with the development of municipal institutions in Russia, there is a great field for contractors capable of installing, among other things, electric light and tramway plant. Hitherto German firms have invariably obtained such contracts, mainly, it is said, owing to the assistance given by the German bankers, which has enabled the manufacturers to give exceptional credit facilities.

**Skipton.**—Mr. W. Emmott, of Halifax, is advising the Council with regard to an electric lighting scheme.

**Stoke-on-Trent.**—A loan of £30,000 is to be applied for. Of this, the sum of £17,000 is for extensions, and the remainder to meet a bank overdraft.

**South Africa.**—Turbo-generators, switchgear, boiler-house plant, and cables are required by the Port Elizabeth Council. Agents, Davis & Soper, 54 St. Mary Axe, London, E.C. Tenders by Nov. 26th.

#### Wiring

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Barnet.**—New infirmary. Clerk, 1 Well House Lane.

**Barrow-in-Furness.**—Public library. Town Clerk.

**Birmingham.**—Extensions to West Heath Hospital (£8,660).

**Horsham.**—Isolation hospital. £3,000.

**Wigan.**—Extensions to public baths. Town Clerk.

#### Miscellaneous

**Accrington.**—It is proposed to light the Burnley Road by electricity.

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Barrow-in-Furness.**—The tender of the B.T.H. Co. for a 2,000-kw. turbo-alternator has been accepted at £6,718. The turbine will be of the four-stage type coupled to a 2,500-k.v.a. three-phase 50-cycle 6,600-volt 3,000-r.p.m. alternator and exciter, with Cole, Marchent & Morley surface-condensing plant. Delivery in eight weeks.

**Bury.**—The following tenders have been accepted:—Two 250-kw. transformers, Ferranti, Ltd.; maintenance of storage battery, Electrical Power Storage Co.

**London: G.P.O.**—A six months' contract for the supply of Osram lamps has been secured by the General Electric Co.

**New South Wales.**—The Government have accepted the tender of the Brush Electrical Engineering Co. for generating plant, condensers, and auxiliaries, for the Albury Electricity Works.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £52 10s. to £53. (Last week the same.)

**"Tucker" Switches.**—In order that their well-known switches shall be easily recognisable, J. H. Tucker & Co. (King's Road, Hay Mills, Birmingham) mark all the porcelain bases of their tumbler switches with their registered word "Telac."

**Reductions in Price.**—Morris & List r (London), Ltd. (3 and 4 Palace Chambers, Bridge Street, Westminster), announce that they are making a general reduction in the prices of their drilling and grinding machines, with a view to securing as much as possible of the trade which formerly went to Germany.

**"Woolwich" Tape.**—Siemens Bros. & Co., Ltd. (Woolwich), announce that they are placing on the market an improved type of "Woolwich" insulating tape of a high quality, entirely free from pinholes. They will be pleased to send samples to electrical contractors on request.

**Canadian Agency.**—An agent in Ontario wishes to represent a British manufacturer of electrical plant. The name is on file at 73 Basinghall Street, E.C.

**Liquidations.**—Stella Signs, Ltd., is to be wound-up voluntarily, and Messrs. A. C. Hutchins, 11 Pancras Lane, E.C., and V. G. Morris, Wardrobe Chambers, Queen Victoria Street, are liquidators. A meeting of creditors will be held at 11 Pancras Lane, E.C., on Wednesday, Nov. 11th, at 11.30 a.m. It will be remembered that Venner Signs, Ltd., recently entered an action against Stella Signs, Ltd., for alleged infringement of patents, but, as we notified a short time ago, the action was settled out of Court.

Mr. W. Schmahl, Managing Director of the Armorduct Manufacturing Co., Ltd., has changed his name to W. Ratcliffe-Small.

Mr. J. J. Easton has joined the Board of Directors of Siemens Bros. & Co., Ltd.

**Contraband of War.**—The Government has issued a further notice proclaiming unwrought copper, aluminium, and motor vehicles of all kinds to be absolute contraband, whilst in the list of conditional contraband articles is included material for telegraphs, wireless telegraphs, and telephones. The component parts of warships, which would presumably include the electrical equipment, are also declared absolute contraband. The export of searchlight carbons has already been prohibited, as well as signalling lamps operated by electricity and capable of being used for signalling Morse or other code.

### LOCAL NOTES

**Barrow: Supply to Vickers.**—In reference to the note in our "Tenders Invited" column last week as to the supply to Messrs. Vickers, this is to be increased from 1,040,000 units to 5,000,000 units per annum for a period of three years, with a guarantee of 3,000,000 units per annum for a further period of two years. The terms of payment previously have been that the amount paid by Messrs. Vickers shall be not less than 10 per cent. on the cost of the mains, namely £1,400, whilst under the new agreement this figure is to be altered to 5 per cent. on the cost of the whole plant necessary to supply Messrs. Vickers, namely, £13,000. Under the new scheme the revenue for Messrs. Vickers will be between £3,000 and £4,000 per annum. This extra supply from the Corporation is not in substitution of, but supplements, the supply which Vickers obtain from their own large generating plant.

**Belfast: The Extension Scheme.**—At the meeting of the Corporation on Monday, the following resolution was passed:—"That, considering the difficulty at the present time of obtaining money at a reasonable rate, the Council be recommended to postpone the erection of new electricity generating works, and, in order to meet the requirements of the ensuing three years, to make such alterations and additions to the plant in the existing works, provide and equip the necessary sub-stations, and provide and lay cables, the total cost not to exceed £25,000."

**Birmingham: Electricity Staff and the War.**—No less than 147 of the staff and workmen of the Electricity Department are on active service, and allowances are being made to them in accordance with the resolution of the Corporation. The total amount being paid in this way is at the rate of £4,500 per annum.

**Chester: The Water-Power Works.**—At the last meeting of the Electricity Committee, Mr. S. E. Britton, City Electrical Engineer, reported that on the basis of the first twenty-three weeks' working of the Water-Power Electricity Works, the annual profit will be about £4,480, compared with the estimate of £3,485.

**Dudley: Sale of Electricity Undertaking.**—The Borough Treasurer has prepared a report dealing with the finances of the late electricity department. The total capital expenditure was £106,183, of which £3,960 was met out of revenue. The rates have contributed £2,000 towards the upkeep of the undertaking, and at the date of sale to the Shropshire, Worcestershire, and Staffordshire Electric Power Co. there was a deficiency of £10,226. The Company has paid the Council £3,762, which is the capital expenditure in excess of loans sanctioned. There is a balance of £60,872 payable by the Company in instalments, and £4,050 has been paid as an agreed sum to clear up accounts to March 31st. The sum of £6,745 has been paid on account of revenue deficit at date of transfer: £633 to provide for liabilities at the time of transfer, and a further £4,352 is payable by annual instalments with interest to complete the transfer.

**Fleetwood: New Plant.**—A new 550-kw. turbo-generator set supplied by James Howden & Co., of Glasgow, was put in operation at the Council's Electricity Works last week. When the Council took over the works of the old Fleetwood Co. in 1909, the capacity was 345 kw. An extension in 1911 increased this to 645 kw., whilst the new generating set just installed increases the capacity of the works to 1,195 kw.

**London: Hammersmith: Supply of Cables.**—The Council's contract with the Western Electric Co. for the supply of cables expired in September, and the Engineer has reported that, having regard to the present market conditions, he has, in issuing invitations to tender, provided for quotations for (1) the supply of definite quantities, and (2) a supply as required for a period of three months.

**Reduced Lighting in London.**—A further order regarding the reduced lighting of London has been issued, applying from November 1st for two months. In streets, squares, and bridges some lights must be extinguished so as to break up conspicuous groups, and the lights must be lowered or made invisible from above. Sky signs, &c., and powerful shop front lights are prohibited, and inside lights of shop fronts must be reduced. Large lighted roof areas must be covered or have the lighting intensity reduced. In tall buildings most of the windows must be shrouded, though moderate lights may be left uncovered at irregular intervals. The lights in railway stations and along the water fronts must be masked, and the lights of tram-cars and omnibuses must be reduced and in crossing bridges completely obscured. Powerful motor-car lamps and the aggregation of flares in street markets are prohibited.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 411 [VOL. X., No. 46]

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THURSDAY, NOVEMBER 12, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

#### Latest Time for Receiving

Letters for Insertion, *Tuesday first post.*

Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

Corrections in Standing Advertisements, *Monday first post.*

All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICE: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn.

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

### SUMMARY

INQUIRIES which we have made show the effect of the war upon the loads of the electricity supply stations throughout the country. In many cases the output has benefited by increased power load, but lighting has decreased with but few exceptions. Load factors have improved. There are a few instances in which outputs have suffered seriously, but for the most part the effect has not been unfavourable (p. 584).

THE electrical equipment of a large battleship building in the United States for the Argentine is described (p. 585).

SOME aspects of the heating and cooking load from the central station engineers' point of view were discussed at a recent meeting of the "Point Fives" (p. 586).

FULL particulars are now published of Lundbergs' Electric Light Switching Competition. The value of the prizes offered has been considerably increased since the previous competition. The actual question papers will appear in our next three issues (p. 587).

THE London County Council decided on Tuesday by seventy-seven votes to seven to proceed with its Electric Power Bill. It is, however, anticipated that the opposition from existing supply authorities may be too strong to permit the Bill passing next session. We report at length a clever and spirited speech in opposition to the Bill by Mr. H. H. Gordon (p. 587).

A DEATH occurred at Greenwich power house of the L.C.C. tramways owing to contact with the neutral bar of a generator. Tests showed subsequently that the earthing of the neutral point of one generator

cannot be relied upon to keep the neutral points of others in parallel with it at absolutely zero potential (p. 589).

THE chairman's address of Mr. T. Roles to the Yorkshire Local Section of the Institution of Electrical Engineers dealt with the war and the Electrical Industry (p. 586).

SPECIFICATIONS were published last week at the Patent Office dealing with frequency raising by static transformers, insulated rail joints, air filters, high frequency alternators, and protective gear. A patent for electric winding plant control is opposed. Patents relating to sparking plugs and wireless telegraphy expire this week (p. 590).

A QUESTION relating to the running of rotary converters "inverted" is propounded in our "Questions and Answers" columns (p. 591).

A CONSIDERABLE scheme of linking up of dead ends, etc., is proposed for the L.C.C. tramways (p. 591).

WE give particulars of the telegraphic dislocation due to the war with Turkey.—The Pacific cable cut by the Germans has been repaired (p. 591).

TEN water-tube boilers and two 15,000 kw. turbo-alternators are required by the Manchester Corporation; cable at Stockton-on-Tees, Batley, Stoke-on-Trent and Willesden; switchgear by the L.C.C.; electric cranes in Spain, and electrical supplies by some railway companies.—An expenditure of £100,000 is contemplated upon electrical extensions at Cape Town (p. 593).

A DISPUTE has again arisen between the Sheffield Corporation and the local contractors. There is also some controversy between the Oldham electrical contractors and the Electricity Committee with regard to the hiring out of motors.—The Maidstone Borough Electrical Engineer has been asked to refund the £200 bonus paid in error.—The Derby Electricity Committee has insured against loss of profits from fire, explosion or electrical breakdown.—The question of the charge for current for cinematograph theatres is creating attention in Islington (p. 594).

THE Metropolitan Electric Supply Co. has decided to pay the dividend on the ordinary shares which was recently postponed.—A satisfactory report is issued by the Edison & Swan United Electric Light Co., but no dividend is declared on the ordinary shares (p. 594).

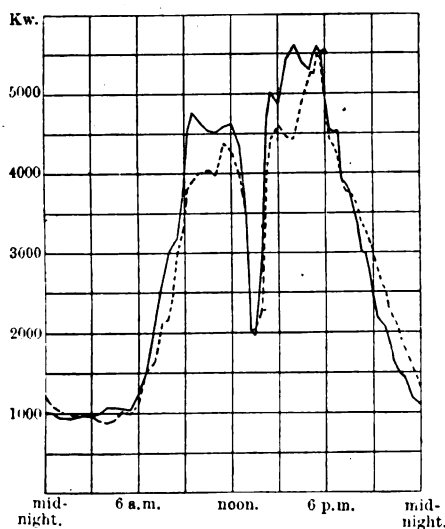
**Belgian Engineers.**—The Society of Engineers, at whose last ordinary meeting about twenty Belgian engineers were present, extend a cordial invitation to all Belgian engineers now in England to apply to the Secretary when they are in need of any information. Those who are unable to call are invited to send their names and addresses to the Secretary so that they may be in touch with their colleagues and receive invitations to the meetings. The offices of the Society at 17 Victoria Street, Westminster, are open daily from 10 a.m. to 4 p.m. (Saturdays, 10 a.m. to 1 p.m.).

(For arrangements for the week see page 588.)



## THE EFFECT OF THE WAR ON THE ELECTRICITY SUPPLY INDUSTRY \*

NOW that the war has been going on for three months, it is possible to review the effect it has had upon the output of the electricity works of this country. Speaking generally, there have been four factors which were bound to influence the demand for electric light and power to a greater or less extent. The first of these was the natural tendency, especially during the first weeks of the war, to economise in every direction, but although this might have affected the consumption for domestic electric lighting, it was more than counterbalanced by the large number of people who decided to forego their summer holidays and, in consequence, used more instead of less electric



STEPNEY LOAD CURVE.

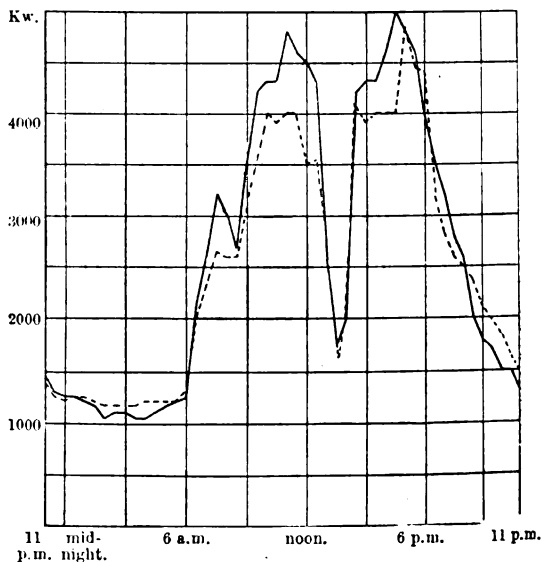
Full Line, Oct. 20, 1914.  
Dotted Line, Oct. 21, 1913.

light at home. The lighting load in London and some other large towns has, however, been diminished to some extent during the past few weeks on account of the diminution of street lighting, and still more owing to the compulsory reduction in intensity of shop-front lighting, and the total drop varies from 5 to 20 per cent. as compared with last year, although this has been to some extent compensated for by the fact that the chief reductions have been on peak load, so that the load factor has improved in spite of the shorter hours of good load just after peak due to early closing. The Kensington & Knightsbridge Co., for instance, has experienced a diminution of 20 per cent. in the maximum load, but only  $4\frac{1}{2}$  per cent. in output. The power load has been increased in some localities and decreased in others, but those stations which have experienced increases have been in the majority. Clothing factories, practically all engineering works, factories of woollen goods and paper works have been working at high pressure and overtime and have, therefore, drawn more power from the central stations; one of the largest cases of increased output is at Barrow-in-Furness, where Vickers's works (as has been already mentioned in our columns) is to be supplied with an additional five million units yearly. On the other hand, the cotton industry has been depressed, so that at Bradford and in some of the Lancashire stations there has been a drop in the load.

Needless to say, it is the seaside towns which have suffered most from decreased output. In Brighton, for instance, in which the lighting load is the main source of revenue to the electricity works, the cur-

tailment of street lighting, outside shop and advertising lighting, and the illumination of the piers has had a serious effect, and other seaside watering-places have been affected in the same way, although the reduction is not to be measured quite in proportion to the illumination of the sea fronts, which present a dismal appearance after dark, owing to the blackening of the lamp globes by order of the Admiralty. Dover is an exception, as the municipal electricity works supply both the War Department and the Admiralty whose electricity requirements have gone up considerably. In Plymouth, on the other hand, there has been a decided drop in output owing to the restricted hours of lighting due to orders from the War Department. Southend generated 412,000 units last month as compared with 437,000 in October, 1913, but the maximum load has risen from 2,392 to 2,553 kw., and the load factor dropped from 27.2 to 24. This includes figures for the trams, the traffic receipts and mileage of which have gone down. The lighting restrictions are very severe, and further drop in output is expected.

Two districts where electric power consumption has increased greatly are Stepney and Poplar. In both cases the lighting load has dropped, but the power load has increased enormously. For the month of September the Stepney Borough Council sold 85,984 more units for power than in 1913 (the corresponding increase from 1912 to 1913 having been 81,011); lighting units, on the other hand, increased only by 4,354 for the month, compared with 42,369 for 1912 to 1913. The power increase is largely due to the number of clothing factories which are working overtime on Government contracts, and is well shown on the typical load curve which we reproduce below. The maximum load is practically the same, but the width of the morning and evening peaks has broadened enormously. The same phenomenon is observable in the neighbouring borough of Poplar, whose load curve for Oct. 30th we also reproduce.



POPULAR LOAD CURVE.

Full Line, Oct. 30, 1914.  
Dotted Line, Oct. 31, 1913.

The following information has been obtained from Lancashire in response to our inquiries:—

*Manchester.*—For the week ended August 1st there was an increase of  $10\frac{1}{2}$  per cent. in the output as compared with the corresponding week last year. The following week, August 8th, the increase had diminished to 5.1 per cent., by the week ended August 15th there was a 2.4 per cent. drop, as compared with last year, but for August 22nd the week's record showed a drop of 11.67 per cent. The following week, however, the output was practically the same as last year, and since then there has been a gradual increase. The falling-off has been entirely due to less lighting; apparently an increase in the general engineering load has made up for any loss from the cotton industry.

*Lancashire Electric Power Co.*—There has been a loss of

\* Among previous articles which have appeared in ELECTRICAL ENGINEERING are the following: "Germany's £14,500,000 Export Trade Analysed" (Aug. 13th), "The Effect of the War on the Electric Lamp Industry" (Aug. 20th), "The Effect of the War on Street Lighting" (Aug. 27th), "The Effect of the War on the Dynamo and Motor Industry" (Sept. 10th), and "Germany's Telegraphic Isolation" (Oct. 8th).

output in the supply to textile industries, but a recovery has already taken place. In other directions the output has not been adversely affected.

**Bolton.**—Here the textile trade has been also responsible for the extremely large reduction in output. During the three months, August, September, and October, the number of units sold was 366,167 less than the corresponding period of last year.

**Oldham.**—Both lighting and power have been considerably reduced.

**Stalybridge, Hyde, Mossley and Dukinfield.**—The output from the works of the joint Electricity Board has diminished about 30 per cent. since the war commenced, owing to the depression in the cotton trade.

**Ashton-under-Lyne.**—There has been a drop in lighting and also generally in power load, but this was compensated by fresh connections which had been arranged prior to the war, and the net result is a slight increase in the total output.

**Bury.**—The drop due to the cotton industry was fully compensated for by increased outputs in the woollen and paper industries.

**Accrington.**—Here the lighting and heating output has risen 18 per cent. and the power demand is about the same.

**Liverpool.**—The lighting output has somewhat decreased, but up to the present the total output has exceeded that of last year.

**Bootle.**—There has been an increase in both lighting and power, but not so great as would have taken place normally.

In many Yorkshire towns the increase in the woollen industry has resulted in an increase in load. Bradford, however, has suffered by the slackness in the cotton industry.

**Huddersfield.**—Both the power and lighting demands are showing very substantial increases; in fact, things are so prosperous that recruiting for the Army is very slow.

**Hullfax.**—The power output has risen 30 per cent.; the lighting has been affected by consumers' economies and the shutting down of the public arcs by order.

**Yorkshire Electric Power Co.**—Generally there has been a considerable increase in the use of supply for power, and the lighting business is going forward at the usual rate. The public are appreciating the advantages of electric power to meeting certain alterations in the working conditions caused by a disturbance of trade.

**Sheffield.**—There have been very large increases indeed in the demands for current for power purposes, as iron and steel works and other large works are running at full pressure on Government orders.

**Leeds.**—During the first few weeks the output decreased seriously, but after the third week conditions commenced to improve, although the demand has not yet quite reached the normal figure. There is, however, a considerable amount of work being done for the War Office and Admiralty, which has, to some extent, neutralised the effect of the war on other branches of trade.

**Bradford.**—This town is very much dependent on the cotton trade and also manufactures largely for export to Germany, so that the power load has fallen off very much, and the tramway load has dropped in sympathy, owing to some mills having been closed three or four days a week. There has, in consequence, been a drop both in maximum loads and output.

The following information has been obtained from other towns and districts:—

**Newcastle-on-Tyne Electric Co.**—Speaking generally, the war has not materially affected either the lighting or power outputs. Increases in some directions have compensated for the decreases in others.

**Sunderland.**—The power load has dropped, due to the normal fluctuation of the shipbuilding and allied trades, but there has been no reduction attributable to the war. The lighting load has gone down about 10 per cent.

**Southampton.**—All outside shop lighting has been stopped by order. The increase in output is 5 per cent., as compared with 15 per cent. last year, and 25 per cent. in 1912. This has, however, been probably due to local conditions rather than to the war.

**West Hartlepool.**—The increase in load for the half-year to September has not been as great as normal, owing to the 10 o'clock closing.

**Darlington.**—The output is practically normal.

**Stockton-on-Tees.**—The quarter ended last September showed an increase of 11 per cent. in lighting and 24 per cent. in power, due to the natural growth of the undertaking, and not due to any war effect.

**Derby.**—There was a temporary drop in power load due to the partial closing down of one very large consumer, but orders from the War Office have rectified this, and both day and evening load curves show an increase of 600 kw. over the corresponding time last year. All trades are busy, especially textile. Twenty-five per cent. of the electricity works employees have joined the Army, and the Borough Electrical Engineer's three sons are also serving.

**Shropshire, Worcestershire, and Staffordshire Electric Power Co.**—A large number of manufacturers have received much work due to the war, but other works, such as cycle manufacturers,

&c., are working with diminished outputs. The output on the station is, however, practically the same as for the corresponding time last year, but the maximum load has dropped. It is estimated that both the load and output would have increased considerably under normal conditions. There are, however, numbers of inquiries for extensions of electric driving, so that the outlook is favourable.

**Wolverhampton.**—In the first part of September the revenue dropped about £125 per week, as compared with last year, but the output is now improving, and for the last week in October was only 10 per cent. less than the similar week of last year. The drop is put down due to the holding up of money, difficulties in obtaining raw material, and the stoppage of export orders.

**Stoke-on-Trent.**—The load has dropped considerably. For the week ended October 24th the output was 171,361 units, as compared with 201,357 in the corresponding week of last year. The maximum load has decreased from 3,232 kw. to 2,803 kw. Many of the local manufacturers are working short time, and the lighting has also diminished.

**Bristol.**—The lighting has gone down. Up to the end of July there had been an increase in consumption of 12.38 per cent., but for August and September there was a diminution of about 2 per cent., as compared with last year. On the other hand, the power consumption had gone up 13 per cent. up to the end of July; for August the increase compared with last year was only 9.7 per cent., but for September 19.08 per cent.

**Cardiff.**—The output shows satisfactory increase in every direction.

**West Bromwich.**—In August the increase in load stopped, but in September normal conditions reasserted themselves, and last month the power output was 20 per cent. greater than last October. Owing to Government orders several large consumers are working day and night.

**Kent Electric Power Co.**—Reductions in street lighting, shop lighting, and closed theatres and music halls have reduced the lighting load, and the power load has also been affected.

**Nottingham.**—Very little difference has occurred as compared with last year, but in some of the local industries, such as lace and fancy leathers, trade is bad.

**Chester.**—Not much affected.

**Tunbridge Wells.**—Unaffected by war, except by the loss of several members of the staff.

**Erith.**—Power load increased, lighting load diminished, load factor improved.

**Beckenham.**—Mainly a residential district. The load has slightly increased due to new consumers in the early part of the year.

**Colchester.**—The lighting order has reduced the load by about 20 per cent.

**East Ham.**—For the period between Oct. 10th and Nov. 7th, the output for light and power has decreased by 32.47 per cent. compared with the same period last year, and the maximum load 39.21 per cent. The district is chiefly a small residential one.

**Glasgow.**—Not seriously affected. The output has increased 12 per cent. for the month as compared with last year, but the previous year the increase for the corresponding month was 20 per cent. The public lighting has not been curtailed, but the public are probably economising.

**Clyde Valley Electrical Power Co.**—The output shows a steady increase over the corresponding period of last year. The consumption by collieries has lessened, but engineering works and shipyards are particularly busy. There has been a saving in generating costs, owing to the collieries being slack and coal cheaper.

## THE ELECTRICAL EQUIPMENT OF A LARGE BATTLESHIP

THE electrical equipment of the Argentine battleship *Moreno*, which is nearing completion in a United States yard, is described in a Paper by Mr. H. A. Hornor, read recently before the American Institute of Electrical Engineers. The vessel is of 27,566 tons displacement, and carries twelve 12-in., twelve 6-in., and sixteen 4-in. guns.

The main generating plant consists of four 375-kw. 230-volt continuous-current Curtis turbo-generators, two placed forward and two aft on the lower platform deck behind armour. There is also a 75-kw. Diesel engine driven set on the gun-deck. The main distribution is two-wire, with rubber-insulated lead-sheathed steel-armoured cables. These are clipped to the ship's structure, and watertight fittings are provided wherever the cables terminate or pass through bulkheads. In the smaller sizes twin cables are used. In some places, as in the gun-turrets, flexible branch leads are used, and in officers' quarters and state rooms special brass-covered wire and three-conductor rubber-insulated wires are used. There are two main distribution boards adjacent to the fore and aft dynamo rooms respectively, as well as various auxiliary boards, so inter-connected that supply is always available. The circuit-breaker relays are interlocked, so that in no case can the different dynamo rooms be placed in parallel. Separate positive bus-bars are used for the

lighting and power circuits, but there are common negative bars. The thirty-eight lighting feeders are divided into three circuits; one for general illumination under cruising conditions, one for white battle purposes, and one for blue battle purposes. In this last circuit the globes are of a deep blue colour, making the light invisible at a short distance. The distribution of the small lighting units has been made with due regard for cross circuits, so that no general spaces of the vessel may be put in darkness by the failure of an individual circuit. Thirty-five and sixty-watt carbon lamps are used, as well as 32-watt tungsten lamps for the ordinary lighting, and for various purposes 250-watt tungsten lamps in special portable reflectors are provided. In all, some 3,000 lamps are employed.

The searchlight installation consists of twelve motor-operated remote-control 43·3-in. projectors, and one portable 13·77-in. signalling projector. These are run from a 2×110-volt three-wire circuit, for which two special balancers are employed, situated near the oil-engine room, with a control and distributing board. The lamp mechanism consists of a small electric motor which moves the carbons through gearing. The field and armature are controlled by a differential relay and two auxiliary relays, which cause it either to stop or rotate to right or left. The first takes place with the current and voltage normal, the second when the amperage is too high and the voltage too low, and the third when the last condition is reversed. Besides the regular field winding, there is an additional winding on the motor field to carry the full lamp current. This produces a strong field when the voltage across the arc falls below normal and furnishes a dynamic braking effect for retarding the movement of the motor armature. For signalling purposes the searchlights are equipped with iris shutters. These are all manually operated except one, in which latter case a venetian blind shutter, remotely controlled, is also provided. A sighting telescope attached to the side of the drum, and a complete lamp telegraph indicating the positions of the searchlight at the controller, are furnished with each searchlight.

The power circuits supply 278 motors for different purposes, ranging from  $\frac{1}{4}$  to 150 h.p., aggregating some 4,000 h.p. and including such varied applications as capstans, windlasses, pumps, ammunition hoists, turret turning and gun training, steering gear, ventilators, workshop tools and miscellaneous machinery; vacuum cleaners, ozonisers, and an "athletic horse." Owing to the diversified nature of these services, comparatively few of these motors are running at once. The power feeders are in some cases lead directly to the motor-starting panels, and in others are taken to special distribution boards. The electrical steering gear is designed as auxiliary to the steam gear, and is controlled through the same tele-motor apparatus on a follow-up system. The rudder can be carried right over in 40 secs., about half the time required by the steam equipment. A 150-h.p. motor is employed, controlled by a master controller with limit switch and a contactor panel in conjunction with the necessary rheostats. In the master controller are two contact cylinders, one for the controller, the other for the limit switch. The controller cylinder works through a connecting rod from the operating shaft of the steering gear. The limit-switch cylinder operates through a sprocket chain from the main steering-gear shaft. The differential gear, the "follow-up" device, is designed to turn the controller cylinder off by motion of the main shaft of the steering gear which turns the limit switch. The latter strengthens the field of the motor when the rudder is displaced more than  $10^\circ$  from the midship position. The mechanical connections are such that the motor will stop when the rudder has reached the angle for which the steering wheel has been turned. The motor field cannot be weakened until all of the accelerating contactors have closed, after which the controller will maintain full field until it has been turned through an angle corresponding to  $3^\circ$  movement of the rudder from starting position, and intermediate field from  $3^\circ$  to  $5^\circ$ , after which the motor will run at weak field until the rudder has reached  $10^\circ$  from the midship position. The limit switch is arranged to stop the motor at the  $35^\circ$  position of the rudder. Dynamic braking is provided in connection with the electro-mechanical disc brake, in order to provide prompt stopping.

The turret-turning and gun-elevating gear are operated by constant-speed motors, and speed variations are accomplished by mechanical means. The main ammunition hoists are operated by hydraulic power, and the electric hoists are provided as an auxiliary. Two upper hoists are fitted in each of the six turrets. The apparatus consists of a contactor panel, the master controller at the bottom of the hoist, the emergency controller at the top of the hoist,

the limit switch and rheostats. When the hoist, therefore, reaches its limit in either direction dynamic braking is introduced and the motor stops. The top and bottom controllers are elaborately interlocked. The electrical anchor windlass equipment forms an auxiliary to the steam windlass, and only runs at half its speed. A 100-h.p. compound-wound motor is used, controlled through contactors by two master controllers, one in the windlass room and the other on the weather deck. The control is semi-automatic; the first three steps are controlled by the master controller, after which the automatic acceleration contactors come into action. There are, of course, other applications of electric power too numerous to particularise. The ship carries a complete Röntgen-ray outfit, and even an electrically-worked cinematograph apparatus.

Another important part of the electrical equipment is the signalling system for transmitting orders throughout the vessel, fire alarms, electric clocks, speed, steering, and other indicators, gun control, &c. These systems are supplied with power from two stations on the vessel, the forward interior communication room and the forward dynamo room. There are two central signalling stations, one forward on the upper platform deck below armour, and the other on the gun deck aft. A number of these equipments work on 220 volts direct current, supplied in duplicate from the forward and after main distribution switchboards. However, certain of the telegraph systems require 120 volts alternating current; others, such as telephone system, clock system, call-bell system, require 15 volts direct current; and the fire-control telephone system requires 35 volts direct current. These transformations are accomplished by means of small motor-generators. The engine room and other order telegraphs are of German origin, working with alternating current and acting on the principle of an unbalanced circuit. The armature of the transmitter is wound with three inter-connected coils and connected by three wires directly to the armature coils of the receiver. The power in the armature windings depends upon the rotative position of the armature coils in the field of force. If the armature of the transmitter and receiver have the same position relatively to the field, then the induced E.M.F. would be of the same value, and the wires between the two armatures would carry no current. If the armature of the transmitter is moved so as to unbalance the armature circuit, then current flows in the armature windings, produces a torque, and the armature of the receiver turns to the same position. When this occurs the equalising currents disappear, and with them the torque.

Electrical pyrometers are used in the boiler rooms, and an unusual part of the equipment is an electrically-recording anemometer of French origin. The Molinari (Italian) speed indicator is used for the turbine revolution and direction indicators. The wireless telegraph equipment is German, acting on the quenched-spark system, taking 8 kw. and giving wave-lengths from 600 to 2,000 metres. The guaranteed range is 621·3 miles by day and 1,304 miles by night. The ship is provided with an equipment of gyrostatic compasses of the German Anschütz pattern, driven from special motor-generators.

**Home Office Prosecution.**—In connection with the explosion at Clifton Colliery, Workington, Cumberland, on Aug. 3rd, some of the officials of the colliery have been summoned for various contraventions of the rules, including causing the Lick-bank seam earth conductors to carry cables carrying electricity to have a cross-sectional area of less than 0·022 sq. in., and with causing cables carrying medium pressure alternating electro current to be unprotected. The case came before the Workington Police Court on Oct. 21st, but was adjourned till Oct. 28th, when the defendants pleaded guilty and no technical evidence was taken. The Bench found that a technical offence had been committed, and said that the payment of costs would meet the case.

**University College, London.**—The calendar of the present session has now been issued, and contains full information regarding the organisation of working of the College. Prospectuses of the courses and examinations in all the faculties are given, with sample examination papers. The electrical engineering department of the Faculty of Engineering, which is under Prof. J. A. Fleming, F.R.S., is fully dealt with, and particulars are given of a number of scholarships and special prizes available to students of these subjects. The ordinary course occupies three years, but arrangements are made for special shorter courses to those partially trained elsewhere, and there are opportunities for research and other post-graduate work.

**Ediswan Works.**—A visit to the Edison & Swan United Electric Light Co., Ltd., was paid by the Polytechnic Engineering Society last week, when the various lamp and fittings departments were seen in active operation.

## LUNDBERGS' ELECTRIC-LIGHT SWITCHING COMPETITION

IN accordance with the announcement made in our last issue, we now give further details of Messrs. Lundbergs' Electric-Light Switching Competition:—

Prizes are offered for the best answers to a series of three question papers (Preliminary, Intermediate, and Advanced), which will be published in the next three issues of *ELECTRICAL ENGINEERING* in the above order. The questions are based on the new and enlarged third edition of "Lektrik Lighting Connections," which will be required by competitors.\* The booklet deals thoroughly with the art of switch control in electric-light installations, and no less than 25,000 copies of it have been printed up to date. Most of the questions set will not be directly answerable from the booklet, but will be real tests that the competitor can see between and beyond the circuits described and illustrated therein.

There is no fee for the examination, and it is only necessary to work out at home, with the help of the booklet, the answers to ONE of the three Examination Papers which will be printed in the next three issues of *ELECTRICAL ENGINEERING*, and to send them on to the Editor.

The answer papers need not reach the offices of *ELECTRICAL ENGINEERING* until Jan. 11th next, so that there will be ample time for those to whom the subject is more or less novel. Papers from competitors residing in the distant colonies may reach these offices any time up to June 1st next; but they will be eligible for certificates only, not the prizes. Any overseas competitors who can get their answers in by Jan. 11th will, of course, be in the running for prizes as well.

The Examination Papers will be Preliminary, Intermediate and Advanced, and the ground covered will be as follows:—The Preliminary will deal mainly with pp. 41 to 66 of the booklet (new third edition).\* The Intermediate will touch on the easier circuits throughout the booklet. The Advanced will deal with the whole of the booklet.

### CERTIFICATES.

Messrs. Lundbergs' Preliminary, Intermediate, or Advanced Electric-Light Switching Certificates will be awarded to all competitors whose papers show a proper degree of excellence; but those *Intermediate or Advanced papers which fall below the standard, though otherwise satisfactory, will be awarded lower-grade certificates.*

### MONEY PRIZES.

*Advanced Grade.*—1st Prize, £5; 2nd Prize, £2 10s.

*Intermediate Grade.*—1st Prize, £3; 2nd Prize, £1 10s.

*Preliminary Grade.*—1st Prize, £1 10s.; 2nd Prize, 15s.

N.B.—In the event of an exceptionally large number of papers being received, an extra prize (or prizes) may be awarded. Further, should any paper show exceptional merit and yet fail to secure one of the above-stated prizes, a special prize may be given in respect thereof.

### BOOK PRIZES.

The six competitors who follow the prize-winners in the Advanced Section will be presented with copies of Mr. Perren Maycock's book, "Electric Circuit Theory and Calculations." The six who follow the prize-winners in the Intermediate and Preliminary Sections will be presented with copies of the book, "Small Switches, etc., and Their Circuits."

The papers will be examined by Mr. W. Perren

\* For the convenience of our readers we have arranged to keep a stock of this Booklet, and a copy will be sent by return of post on receipt of seven penny stamps. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 23, Temple Chambers, London, E.C.

Maycock, M.I.E.E., and the names (or *noms-de-plume*) of the successful competitors will be announced in *ELECTRICAL ENGINEERING* of Feb. 25th next.

The practical use of the above tests is proved by the fact that as the result of the last two examinations, 147 competitors passed in the Preliminary Grade, 73 in the Intermediate Grade, and 43 in the Advanced Grade. The names were announced in *ELECTRICAL ENGINEERING* of Nov. 6th, 1913, and April 30th last.

## FUTURE OF LONDON'S ELECTRICITY SUPPLY Scheme Passed by L.C.C.

THE scheme of the London County Council for dealing with the supply of electricity in the large area outlined in the Special Committee's report (*ELECTRICAL ENGINEERING*, July 30th, p. 428, and Nov. 5th, p. 577), was passed at the meeting on Tuesday by 77 votes to 7. This decision was arrived at after the defeat of an amendment by Sir John Benn that the scheme should be entirely municipal, and another amendment by Mr. H. H. Gordon (Stepney) that any municipality in the proposed area could by resolution contract out of the scheme, and not incur any financial responsibility under it. In the final voting a considerable number of Progressives voted for the scheme; the general feeling was that it is urgent, and the only difference of opinion was as to the desirability of co-operation with the proposed new Company. Sir John Benn's amendment on this point was defeated by 63 votes to 44, but only 8 members voted for Mr. Gordon's proposition. The proceedings were watched by a number of those intimately concerned in the scheme, including Mr. C. H. Merz, whose report to the Council was given in *ELECTRICAL ENGINEERING*, April 16th, p. 213; Mr. H. Renwick (County of London Electric Supply Co.); Mr. James Devonshire (North Metropolitan Electric Power Co.); Mr. W. C. P. Tapper (Chief Electrical Engineer, Stepney); and Mr. J. W. Beauchamp (Chief Electrical Engineer, West Ham).

The discussion followed on party lines, the Moderates contending that considerable concessions had been made to the other side in order to arrive at a compromise. Each party acknowledged the good work of the other on the Special Committee, which has drawn up the scheme. Mr. H. H. Gordon, however, who has been associated with the Stepney electricity undertaking, attempted to show, in a long speech, that the scheme was bad both technically and financially, and alleged that Messrs. Merz & McLellan's report (*ELECTRICAL ENGINEERING*, April 16th, p. 213) was founded on false promises. The general feeling that London was handicapped by dear electricity was not, he maintained, borne out by the facts; indeed, electricity was cheaper in London than in any of the big cities in the world, except, perhaps, Chicago, which had an exceptionally large traction load. The average prices he quoted were New York, 2.6d. per unit; Boston, 2.7d.; London, 2.3d. He agreed that there were too many producers of electricity in London, but there were two schools of thought to be considered in tackling the problem. The first one he termed the evolutionists', in which could be numbered Sir John Snell, Sir Alexander Kennedy, and all the engineers who had been practically engaged in this and similar problems. The opinion of this school was that London could not be treated as virgin ground, and we could not afford to scrap the plant already installed. The only way was to proceed gradually, make the utmost of the plant now in use, and evolve the big scheme in that way. The other school of thought he termed the megalomaniacs', whose idea, based on foreign thought and culture, was to scrap everything at the earliest possible moment in order to embark upon the large scheme with large power stations. He belonged to the evolutionists. He complained that the Committee gave no figures as to the possible financial results, and the only figures before them were in the experts' report. In this it was stated that if the 1911-12 average costs remained stationary until 1920, the big scheme would show a decrease of 34 per cent. in working expenses. But already three London boroughs, in the two years since 1911-12, had improved upon their figures from that year by 20 per cent., and it seemed extremely unlikely there would be any saving in the big scheme at all. Again, the whole proposition was on the basis of capital being borrowed at 4 per cent., but who was sanguine enough to suppose that, after the war was over, money would be obtained on such terms? He maintained that many of the existing supply authorities would be able to produce as cheaply as the proposed new authority, and so could not be customers of that body, yet they would have, under the scheme, to ask the permission of their trade rival before they could extend their works. The best way was to seek the co-operation of the existing authorities and work the thing out gradually. By far the greatest pro-



portion of the cost of electricity supply was capital charges, and to increase the capital expenditure, having regard to the plant already installed, could not seriously reduce the charge to the consumer.

Sir John Benn, Mr. Harris, and Mr. Gilbert, on the Progressive side, took the view that in bringing in the proposed new company the Council was riding for a fall when the Bill came before Parliament, as Committees of Parliament which had previously dealt with the matter had always expressed the opinion that the Bill should be the authority.

On the other side Mr. Hume, Chairman of the Special Committee, Mr. Cyril Jackson, and Mr. Reynolds said that any scheme produced on purely party lines was doomed to failure in the Council itself. Already a group had expressed themselves willing to form the new company, and the right thing to do was to let a Parliamentary Committee go into the proposal. Schemes with similar control were working satisfactorily in several cities in other parts of the world, and none of the previous schemes to deal with London had had less compulsion in them than the present one. At the same time, it was hinted that if the opposition in Parliament was so strong as to imperil the Bill this session, then, in order to avoid controversy at the present time, Parliament would be asked to postpone the Bill until the following session.

**Engineering in Scotland.**—Mr. Blyth's Presidential address to the Institution of Civil Engineers last week dealt with the progress of all branches of engineering in Scotland. With reference to electrical developments, he said that so far nothing had been done in Scotland with regard to the electrification of the railways, but, he continued, "I think there can be no doubt it would be a great improvement and a considerable saving in cost if many of the suburban tunnel lines in and around Glasgow were equipped for electric traction." In speaking of the electrical utilisation of water power, he referred to the first works of the British Aluminium Co. at the Falls of Foyers, and to the scheme in conjunction with the Highland Water-Power Co. for taking the waters of Loch Erich and some smaller lochs in Perthshire right across Argyllshire for use at a manufacturing station at the head of Loch Leven. This scheme was, however, rejected, but a modified scheme was carried through without encroaching on Loch Erich with a dam at the west end of Blackwater Lochs and pipe to the head of Loch Leven. These works are now in full operation, and several large companies are now working in Scotland producing electricity for power and lighting purposes. Tramways, he said, were to be found in all the principal cities, and in many country districts, and these, with the single exception of Edinburgh, are worked on the overhead electric system.

**Trading with the Enemy.**—The Committee of the Employers' Parliamentary Association have passed resolutions recording their opinion that the restrictions laid down by the Trading with the Enemy Proclamation No. 2 and the Trading with the Enemy Act are inadequate. They consider that the expression "enemy" should be extended to embrace any German or Austrian person or group resident in any country, and any company whose management or interests are wholly or preponderantly under German or Austrian influence, or where capital to the extent of one-third is held by Germans or Austrians. The status of such companies to be determined by their status on June 1st last. They also urge that provision be made for a licence to trade being granted on application to suitable enemy firms, provided that their businesses be placed in the hands of a Receiver, except in the case of small self-contained businesses not forming branches of a concern in an enemy country, but that in no case should such a licence be granted to an enemy in this country merely agenting the products of enemy countries.

**British Trade with the Straits Settlements.**—Mr. A. Stuart, Registrar of Imports and Exports at Singapore, the Correspondent of the Board of Trade for the Straits Settlements, who is now on a visit to England, will attend at the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, London, E.C., on Tuesday, Wednesday, and Thursday, Nov. 17th, 18th, and 19th, between the hours of 10 a.m. and 5 p.m., and will be pleased to see by appointment British manufacturers and traders not represented in the Straits Settlements who may desire to consult him regarding trade conditions and openings in that Colony. Applications for appointments with Mr. Stuart should be made promptly to the Director of the Commercial Intelligence Branch, as above.

**Storage Battery Working.**—At the Junior Institution of Engineers, Mr. R. Rankin lectured recently on "The Working of Storage Batteries." Particular stress was laid on the necessity of giving a battery a good send off by a proper first charge, and the necessity of continuing it until there was a complete cessation of increase in specific gravities and voltages was insisted on. One fruitful source of trouble was excessive discharging, and Mr. Rankin described an instrument which he had invented to enable battery operators to keep within proper limits. Attention was drawn to the necessity of keeping proper log sheets. It could not be expected to keep their cells in decent condition unless hydrometers and cell-testing voltmeters and means for giving individual cells a boosting charge in excess of that given to the main body of the battery were provided.

## THE POINT FIVES

At a meeting of the "Point Fives" at Manchester, on October 16th, Mr. F. Ayton (Ipswich) was elected a member. Mr. W. G. Pickvance (Wrexham) was in the Chair, and delivered an address on the aims and objects of the Association, the principle of which was to encourage the development of electric supply for domestic purposes other than lighting at not more than one halfpenny per unit. The question of the power load was, he thought, outside their scope. He particularly favoured the hiring out of cookers and heaters and the securing of the co-operation of manufacturers in this way. In cases where powers of this work were unobtainable, he even suggested that the engineer should be allowed to carry on a wiring fittings business on his own account. The domestic load was going to be of great importance to the small supply engineer, who was threatened by a reduction of his lighting revenue and had no power-load to fall back upon, but he must not lose sight of the fact that large extensions of mains must be provided for in framing a tariff, as well as a certain amount of extension of generating plant. The matter was not so easy as the building up of a power-load, as the cooker was not in as advanced a stage as the electric motor; although it was fast improving in reliability, its cost was still a great handicap in competition with the gas cooker.

In the discussion Mr. G. T. Allen (Wolverhampton) explored the effect of municipal gas departments preventing electricity departments using the full powers they possessed for hiring out electric cooking appliances. Mr. F. V. W. Purse (Carlisle) spoke of the handicap to authorities who had not those powers, and Mr. A. H. Shaw (Ilford) referred to difficulties of a similar nature. The reliability of modern forms of electric cooker was vouched for by Mr. W. H. Cooke (Luton), Mr. H. A. Nevill (Wakefield), Mr. Hame (York), Mr. A. H. Seabrook (Marylebone), and Mr. T. Roles (Bradford) spoke favourably of an electric heater manufactured by the British Electric Heater Co., and said that we were just on the point of solving the domestic hot water problem. Mr. J. H. Bowden (Poplar) described the policy that he was adopting with artisans' dwellings. These were fitted with six lights and a hot plate, which latter would do nearly all the cooking required in that particular class of residence. The wiring was included in the price charged, and the prepayment system by slot meter was adopted. The total charge to the consumer (including wiring, supply of hot plate and current) was from 1s. 6d. to 2s. per week. This was probably the first time that electric cooking had been attempted in property of this class. Many of the speakers agreed that there would be no serious trouble with the mains question.

The Chairman in his reply said that the problems facing the small station engineer were greater than those that had to be dealt with by engineers having larger undertakings to control. Until their association could adopt measures to attract those undertakings whose circumstances were more favourable, there would be little chance of inducing small undertakings to adopt this tariff. He felt that, once thoroughly established on a commercial basis, the sale of cookers at a reasonable rate would give the opportunity to the small undertakings for which they were waiting. He believed that people in houses of rentals varying from £25 to £50 would be the most likely to adopt electric cooking.

**Arrangements for the Week.**—To-day (Thursday), November 12th. Institution of Electrical Engineers. "Cables," by C. J. Beaver. 8 p.m.—Greenock Electrical Society, 21 West Stewart Street. "Rotary Converters," by P. C. Kerr. 7.45 p.m.

Friday, Nov. 13th. Physical Society, Imperial College of Science, London. "A Bridge for the Measurement of Self-Induction," by D. Owen. 8 p.m.—Wireless Society of London, at Institution of Electrical Engineers. "The Function of the Earth in Radio-Telegraphy," by Dr. J. A. Fleming, F.R.S. 8 p.m.

Saturday, Nov. 14th. Birmingham and District Electric Club, Swan Hotel, New Street. "Gas Turbines," by W. Fennell. 7 p.m.

Monday, Nov. 16th. Electro-Harmonic Society, Holborn Restaurant. Concert (Ladies' Night). 8 p.m.

Tuesday, Nov. 17th. Institution of Electrical Engineers, Manchester Section, at Engineers' Club, Albert Square. "Cables," by C. J. Beaver. 7.30 p.m.—Institution of Civil Engineers. "Economics of Electric Railway Distribution," by H. F. Parshall. 8 p.m.

Wednesday, Nov. 18th. Institution of Electrical Engineers, Birmingham Section, at University. Chairman's Address, by Dr. A. H. Railing. 7.30 p.m.

Thursday, Nov. 19th. Institution of Electrical Engineers, Dublin Section, at Royal College of Science. Chairman's Address, by Mr. G. Archer. 8 p.m.

Friday, Nov. 20th. Institution of Mechanical Engineers. "The Effect of Vacuum on Steam-Turbines," by G. G. Stoney, F.R.S.

## BOOKS

*We shall be pleased to send any of the following books to addresses in the United Kingdom at the prices named.*

*Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-206 Temple Chambers, Temple Avenue, E.C., and should be accompanied by a remittance.*

- Electric Wiring. W. C. Clinton. 3rd ed. 2s. net; by post, 2s. 3d.
- Electric Light Fitting. S. C. Batstone. 5s. net; by post, 5s. 4d.
- Electric Circuit. Theory and Calculations. W. P. Maycock. 3s. 6d. net; by post, 3s. 10d.
- Electric Wiring, Fittings, Switches, and Lamps: Circuits. W. P. Maycock. 6s. net; by post, 6s. 4d.
- Electrical Tables and Memoranda. S. P. Thompson. 2nd ed. 1s. net; by post, 1s. 1d.
- Electricity in Factories and Workshops. A. P. Haslam. 7s. 6d. net; by post, 7s. 10d.
- Ship Wiring and Fitting. T. M. Johnson. 1s. net; by post, 1s. 1½d.
- Mill and Factory Wiring. R. G. Devey. 2s. net; by post, 2s. 2d.
- Electrical Mining Installations. P. W. Freudemacher. 2s. net; by post, 2s. 2d.
- Lektrik Lighting Connections. 3rd ed. 6d. net; by post, 7d.
- Bells, Indicators, Telephones, and Burglar Alarms, &c. Redfern and Savin. 1s. 6d. net; by post, 1s. 7½d.
- The Uses of Electricity. Part I. Electric Lighting. 1d.; by post, 2d. Part II. Electric Cooking and Heating. 2d.; by post, 3d. Part III. Works Driving. 2d.; by post, 3d.
- Simple Electric Cookery. May Little. 1s. 6d. net; by post, 1s. 9d.
- Electric Cooking, Heating, Cleaning, &c. A Manual of Electricity in the Service of the Home. By "Housewife." 3s. 6d. net; by post, 3s. 10d.
- Arc Lamps and Accessory Apparatus. J. H. Johnson. 1s. 6d. net; by post, 1s. 7½d.
- Institution of Electrical Engineers' Wiring Rules, with Extracts from the Board of Trade Regulations and the Home Office Rules for Mines. 6th ed. 6d. net; by post, 7d.
- Village Electrical Installations. W. T. Wardale. 2s. net; by post, 2s. 2d.
- Dynamo and Motor Attendants and their Machines. F. Broadbent. 7th ed. 1s. 6d. net; by post, 1s. 9d.
- Continuous Current Dynamos and Motors and Their Control. W. R. Kelsey. 2nd ed. 7s. 6d. net; by post, 7s. 10d.
- The Induction Motor. B. F. Bailey. 10s. 6d. net.
- Foundations and Machinery Fixing. F. H. Davies. 2s. net; by post, 2s. 2d.
- Storage Batteries. H. W. Morse. 6s. 6d. net; by post, 6s. 10d.
- Primer of the Internal Combustion Engine. H. E. Wimperis. 2s. 6d. net; by post, 2s. 9d.
- Suction Gas Plants. C. A. Smith. 2nd ed. 5s. net; by post, 5s. 4d.
- Diesel Engines for Land and Marine Work. A. P. Chalkley. 8s. 6d. net; by post, 8s. 10d.
- Junior Magnetism and Electricity. Jude and Satterly. 2s. 6d. net; by post, 2s. 9d.
- Electrotechnics. J. Henderson. 3s. 6d.; by post, 3s. 9d.
- Technical Electricity. Davidge and Hutchinson. 3rd ed. 5s. 6d. net; by post, 5s. 10d.
- A Primer on Alternating Currents. W. G. Rhodes. 2s. 6d. net; by post, 2s. 9d.
- Arithmetic of Electrical Measurements. W. R. P. Hobbs. 16th ed. 1s.; by post, 1s. 2d.
- The Slide Rule. A Practical Manual. C. N. Pickworth. 12th ed. 2s. net; by post, 2s. 3d.
- Practical Telephone Handbook and Guide to Telephone Exchanges. J. Poole. 5th ed. 6s. net; by post, 6s. 4d.
- Telephone Erection and Maintenance. H. G. White. 1s. 6d. net; by post, 1s. 9d.
- Common Battery Telephony Simplified. W. Atkins. 3s. net; by post, 3s. 3d.
- Magneto and Electric Ignition. W. Hibbert. 2s. net; by post, 2s. 2d.
- Dynamo Lighting for Motor-cars. By M. A. Codd. 2s. 6d. net; by post, 2s. 10d.

*Larger or more advanced books on many of the above subjects, and also on other branches, will be recommended on application.*

**German Electrical Trade with Canada.**—The (Canadian) *Electrical News* publishes the following approximate values of German electrical exports to Canada during 1912: Dynamos, motors, transformers, &c., £1,350; cables, £500; arc lamps, £550; metal filament lamps, £27,350; carbon lamps, £5,400; signalling and protective apparatus, £11,650; apparatus for lighting, transmission of power, &c., £3,200; electro-mechanical apparatus, £300; measuring instruments, £3,650; batteries, &c., £650; heating and cooking apparatus, £100; insulating tubes, £250; total, £54,950. The corresponding totals for 1911 and 1910 are £30,200 and £14,750.

## FATAL SHOCK FROM NEUTRAL BAR

A CURIOUS death from electric shock at the Greenwich power house of the London County Council was investigated at the Greenwich Coroner's Court on Monday. David Macredey, an engineer at the power station, had his attention called to a leaky gland on a transformer oil-pump. Going to look at it, he at the same time inspected the oil-gauge, to do which he climbed the channel irons fixed around the transformer, the projections of which form steps. He stood upon one of these irons with his back to the concrete wall. Close to his head was the neutral bar of one of the generators, which was uninsulated, and by some means his head came into contact with this, as was shown by the presence of blood and hair upon it. Normally, of course, there should not be a very high pressure at this point, and under the Home Office regulations any point must be protected where the pressure exceeds 125 volts. A test after the accident, however, showed that the pressure was between 450 and 500 volts. The bar in question was not directly earthed. To present an interchange of current between machines in parallel through the neutral points of the star windings due to the "third harmonic" effect, only one machine is earthed (through a resistance), and it is, of course, assumed that the neutral points of the others also assume zero potential. A small difference might be expected owing to slight inequalities in the windings, but so large a voltage as this—about 0·8 per cent. of the pressure of 6,000 volts between phases—was not anticipated. Unfortunately, deceased, who was fifty-four years of age, suffered from a badly diseased heart, and as his feet must have been making a good earth, a 450-volt shock right through his body was sufficient to kill him. The necessary protection to these bars has now been fitted. The jury returned a verdict of accidental death. Mr. G. S. Ram, Chief Electrical Inspector to the Home Office, was present, and called attention to the need for applying artificial respiration for a prolonged period. He referred to a case where a healthy man in South Wales received a 2,000-volt shock, and the doctor certified him dead. After the departure of the doctor, however, his comrades recommenced artificial respiration, and succeeded in saving the man's life. There was always, he said, a chance for two hours. In the present case efforts were made to restore life for more than an hour, and there is no suggestion that a longer period would have been of advantage, especially as the man had a weak heart, as already stated.

## ELECTRICAL ENGINEERS AND THE WAR

THE subject chosen by Mr. T. Roles for his Chairman's Address to the Yorkshire Local Section of the Institution of Electrical Engineers was the relation of the war to the British electrical industry. The first question to all those of suitable age and health was whether they should take up arms, but the consideration should not be lost sight of as to whether one could assist in securing our country's victory better by bearing arms or remaining at home and carrying out work which, though more prosaic, was none the less necessary. After urging that all who possibly can should answer their country's call, Mr. Roles considered the immediate duties devolving on those who decided to remain in civil life, and summarised them as follows:—To execute with energy all work on which they may be engaged which is in any way connected with military requirements. To assist by all means in their power persons who are anxious to join the military forces in the attainment of their desire, and to encourage those who are capable of bearing arms, and are in a position to do so, to enlist. To assist in and to encourage all efforts made to contribute to the comfort of our troops on active service and the welfare of their dependants at home. To do all possible to support the sentiment "Business as Usual" with regard to the electrical industry in particular and all other British industries in general. To assist in every way possible the efforts which are being made by British manufacturers to capture and retain foreign and colonial trade which until recently has been in the hands of alien enemies. To consider carefully the methods of educating and training young electrical engineers with a view to reorganising and improving such methods, in order that in future the designing as well as the manufacture of all electrical apparatus required for the naval and military services shall be carried out by British-born subjects. Special attention should also be given to business training, so that the business methods of British firms may be entirely up-to-date, and their sales organisation controlled by Britishers.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published Nov. 5th, 1914

A full list of those of electrical interest among these was published in our last issue. The following are abstracts of some of the more important specifications

Names in italics indicate communicators of inventions from abroad.

15,729/13. **Frequency Raising.** A. M. TAYLOR. In a system of frequency raising by static transformers, as described in Spec. 8,853/11 (see ELECTRICAL ENGINEERING, Vol. VIII., p. 448, Aug. 8th, 1912; and April 30th, p. 238), as applied to wireless telegraphy, a method of reducing the period covered by the E.M.F. of the secondary or working transformer by the application to the primary of an E.M.F. wave having a peak of shorter duration than the natural period of the source of supply. (Four figures.)

19,603/13. **Insulating Rail Joints.** B. R. WILLS and J. C. SYKES. The fish-plates and other necessary parts are insulated by vitreous enamel coatings on layers of prepared metal.

23,281/13. **Air Filters.** HEENAN & FROUDE and W. WHEAL. Filters for cooling and purifying air supplied for ventilation of generators, in which a number of convolutions of sheet metal, cloth, or other material are wound about a central shaft and partly immersed in water in an enclosed casing, through the upper part of which and through the convolutions of the drum the air is drawn in an axial direction. (Two figures.)

23,557/13. **High-frequency Alternator.** MARCONI'S WIRELESS TELEGRAPH Co. and C. S. FRANKLIN. In this machine, the stator has a number of poles separated from each other and arranged in lines, and the rotor has long poles making a small angle with the stator pole lines, so that each rotor pole passes in succession across the row of stator poles. (Four figures.)

25,598/13. **Protective System.** B.T.-H. Co. and E. B. WEDMORE. An A.C. protective system in which the inductive effects of the current in the several phases and the neutral are added for the purpose of disconnecting the source of supply on the occurrence of an internal fault only. (Six figures.)

25,695/13. **Choking Coils.** K. M. FAYE-HANSEN. Choking coils having completely closed external magnetic shells with laminæ parallel to the axis of the coil and built up to a height greater than the width of the opening of the coil, the opening thus formed constituting an air-gap, which may be filled in with non-magnetic material.

16,319/14. **Traction Control.** A. J. HALL and L. G. RILEY. A system of control of single-phase locomotives by contactors with automatic acceleration and other features. (Two figures.)

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** CLOTHIER and A. REYROLLE & Co. [Protective systems] 27,660/13; CALLENDERS CABLE & CONSTRUCTION Co. and KAY [Cable supports] 1,143/14; CREIGHTON [Protective devices] 5,542/13.

**Ignition:** PLUMSTEAD [Ignition of gas burner] 28,499/13; SPADA [Spark plug] 2,499/14.

**Switchgear, Fuses and Fittings:** YATES [Fuses] 12,953/14.

**Telephony and Telegraphy:** QUITO [Synchronisation by electric waves] 20,798/13, and [Remote control of torpedoes] 21,212/13; FOOTE [Telephone transmitting apparatus] 22,157/13; WESTERN ELECTRIC Co. (Woodward, acting for W.E. Co.) [Exchange systems] 23,565/13; HANCOCK [Telegraph insulators] 24,755/13; CONNER [Telephone switching] 27,905/13; ARNOLD [Telephone relays] 9,092/13.

**Traction:** W. R. SYKES INTERLOCKING SIGNAL Co. and TARRANT [Signal relays] 25,332/13.

**Miscellaneous:** COATES and A. REYROLLE & Co. [High-tension terminals] 23,342/13; BAKER [Electrical treatment of animals] 28,415/13; JOYCE and SPAGNOLETTI, LTD. [Ignition of miners lamps] 15,324/14; FAIRHOLME and CLARKE [Apparatus for electrocuting animals] 17,603/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Incandescent Lamps:** PROGRESS MOTOREN UND APPARATENBAU GES., 27,657/13.

**Telegraphy and Telephony:** DIXON [Printing telegraph receivers] 10,716/14; SCHIESSLER [Wireless telegraphy and telephony] 11,708 and 11,709/14.

**Miscellaneous:** DEAN [Electric horns] 5,347/14; ESC. ANON. DES ETABLISSEMENTS L. BLERHOT [Car lighting] 20,505/14; KRAGH and MEYER [Telegraphophone] 21,185/14.

### Amendments Allowed

18,661/14. **Electric Mine Signalling.** STERLING TELEPHONE and ELECTRIC Co., LTD., and J. W. DUNGEY. Leave has been given to add the name of F. G. Bell as an inventor in this application.

26,660/12. **Vacuum Cleaner Control.** R. F. CAREY and R. WAYGOOD & Co., LTD. This specification has been amended by way of disclaimer. It describes a method of remote control of the exhausting pump by the operator at the hose. The switch is actuated by a fluid pressure relay worked through a pipe alongside the hose controlled by a valve at the nozzle. The system is applicable in a modified form to hydraulically driven vacuum pumps.

29,359/12. **Party Line Telephones.** AUTOMATIC TELEPHONE MANUFACTURING Co. This specification has been amended by way of disclaimer. It describes an improved party line telephone system in which automatic switches are employed for establishing contact between a calling and a called subscriber's line, and in which the ringing current is applied automatically to a called party line in order to signal selectively the different stations of the party line.

### Opposition to Grant of Patents

Opposition has been entered to a grant on the following application:—

19,443/13. **Motor Control.** B.T.-H. Co. and R. D. GIVEN. This is for a system of controlling three-phase winding motors by liquid rheostats with variable liquid level, in conjunction with a pneumatically actuated reversing switch. A separate rheostat is used for each direction of rotation of the motor.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

20,507/00. **Spark plug.** R. F. HALL. Sparking plugs with a later insulating body fitting tight into the case of the plug. Double pole and double contact plugs are described, as well as the ordinary kind. (This is the plug known as the E.I.C. plug.)

20,576/00. **Wireless Telegraphy.** J. A. FLEMING and MARCONI'S WIRELESS TELEGRAPH Co. Controlling the emission of waves by the action of a jet of compressed air on the spark discharge.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** BRITISH INSULATED & HELSBY CABLES, LTD., and F. A. COLE [Cable armouring] 15,641/08.

**Electrochemistry and Electrometallurgy:** S. E. PAGE (*Universal Electric Welding Co., U.S.A.*) [Welding of angle and T-pieces] 15,424/08; B. E. D. KILBURN (*E. Oesterle, U.S.A.*) [Electric furnace] 15,645/08.

**Incandescent Lamps:** SOC. FRANÇAISE D'INCANDESCENCE PAR LE GAZ (SYSTÈME AUER) [Metal filament lamps] 15,913/09.

**Switchgear, Fuses and Fittings:** F. T. REID [Time switches] 16,646/06.

**Telephony and Telegraphy:** A. T. M. JOHNSON and JOHNSON'S SECRET WIRELESS TELEGRAPH & TELEPHONE TESTING SYNDICATE [Wireless syntonic relays] 16,746/06.

**Traction:** JOHNSON-LUNDELL ELECTRIC TRACTION Co. [Regenerative control] 15,275/08; M. E. CURWEN (*Brill Co., U.S.A.*) [Tramcar trucks] 15,750 and 1/08.

**Miscellaneous:** H. SEFTON JONES [Electric vehicles driving and steering by same wheels with control interlocked with steering gear to give differential action] 16,489/02; E. C. R. MARKS (*Soc. Anon. Italiana e Ansaldo, Armstrong & Co., Genoa*) [Gun training] 15,660/08.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,416.

Discuss the advisability of running "inverted" rotaries in parallel on both D.C. and A.C. bus-bars, (1) in parallel with each other; (2) in parallel with each other and a separate A.C. supply. The rotaries in question are shunt wound, and are fitted with direct-coupled exciters, and each feeds into the A.C. bus-bars through a separate transformer.—"M. S."

(Replies must be received not later than first post Thursday, Nov. 19th.)

### ANSWERS TO No. 1,414.

No reply worthy of an award has been received.

## ELECTRIC TRACTION NOTES

The London County Council proposes to apply to Parliament next session for various new tramways and linking-up of dead-ends, at an estimated cost of £787,035 for construction and £94,850 for street widenings.

Although the Bristol Corporation has received Parliamentary powers to purchase the Bristol Tramways and Carriage Co., there is still considerable opposition to the idea, and on behalf of the owners and occupiers who petitioned against the Corporation Bill in Parliament last session, Mr. A. Dickinson has prepared a report, giving his views as to the financial aspect of the purchase. Mr. Dickinson estimates that the Corporation may be called upon to pay about £1,215,000 as the purchase price of the undertaking.

The draft agreement between the Stoke-on-Trent Corporation and the Potteries Electric Traction Co. proposes that the Corporation shall not exercise any of its purchase powers before the year 1940, in consideration for which the Company will pay the Corporation £2,000 per annum for the next thirteen years and £3,000 per annum after that until 1940. The Company also undertakes to double certain lines and carry out a number of other improvements as regards rolling-stock, &c.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The Egyptian Authorities notify the interruption of the El Arich route.—On the 4th inst. the Zante cable was so busy as to involve delay of twenty-four hours and over to telegrams. The Chio-Tchesne cable had also ceased working.—Lines between Dombé Grande and Quilengues were down on the 6th inst. Messages are being sent *via* Mossamèdes.—Telegraphic service with the interior of Hayti has been

suspended.—Cable communication with Syra is interrupted between Constantinople and Tenedos. The *via* Fao route is also down.—Messages for Tauris, Khoi, Salmas, and Ourmia cannot be accepted, owing to failure of lines.—The British India Administrations will stop all telegrams in transmission for Turkey.—The Obock-Djibouti cable is broken, and messages are being sent *via* Obock.—The route to the Dutch East Indies *via* Guam and Yap is suspended.—The Pacific Cable Board has now restored the Fanning Island cable, interrupted by the German cruiser *Nürnberg*.

A German named Harold Fochtenberger, aged 20, who was, it is reported, working at Siemens Bros. & Co.'s works under an assumed name, was found to possess a complete wireless telegraph apparatus at his home at Thorpe Bay, near Southend-on-Sea, and has been handed over to the military authorities to be dealt with.

## CATALOGUES, PAMPHLETS, &c., RECEIVED

**TRAMCAR LIGHTING.**—A convenient combined switch and fuse for tramcar lighting circuits is described in a pamphlet from the British Thomson-Houston Co., Ltd. (Rugby). The base and cover are of glazed porcelain in the 600-volt design, and of a special moulded insulating material in that for higher voltages, and a cartridge fuse mounted in clips so as to be easily replaceable is employed.

**ELECTRIC COOKING.**—The Brompton and Kensington Accessories Co., Ltd. (254-260 Earl's Court Road, S.W.) have issued a series of leaflets forming a complete catalogue of electrical cooking appliances, including complete cooking stoves and ranges in several designs, both for domestic and restaurant cooking, hot cupboards and carving tables, grills and toasters, as well as many attractive forms of table apparatus, such as water heaters, kettles, breakfast grills, coffee percolators, tea-pots, hot plates, and flat irons.

Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."

**ELECTRIC CLOCKS.**—A descriptive catalogue of electric clocks has just been published by the Magneta Time Co., Ltd. (14 Soho Square, W.C.). In this system, which is in extensive use, there are neither batteries nor intermittent contacts, as the current impulses are produced magnetically. A large number of forms of master clock and dial are illustrated, and many buildings are mentioned where they are in use. We are informed that all the apparatus concerned is of British manufacture, being made at the company's Watford Works.

**POSTER.**—Rawlings Bros., Ltd. (82 Gloucester Road, South Kensington), have sent us a postcard on which is reproduced an attractive poster, designed by Mr. Kelly, a member of their staff. It is entitled "In a Warm Corner," and shows a very satisfied recruit warming himself at a radiator, which is humorously said to be supplied with current by the field battery. The same artist produces a poster, which is exhibited at Gloucester Road and South Kensington stations every month.

**DYNAMOS AND MOTORS.**—A comprehensive list of electrical plant is to hand from the Anglo-Colonial Engineering Co., Ltd. (13 City Road, E.C.), containing full particulars of continuous-current dynamos and motors of the open and semi-enclosed types, totally enclosed motors, motor starters, and field regulators, alternators, induction motors, storage batteries, transformers, blowers, electric drills, and pumping plant.

**The Electrical Ironmonger.**—On Tuesday of last week a paper was read before the Birmingham branch of the Ironmongers' Association, by Mr. W. E. Milns, of the Birmingham Corporation Electric Supply Department, dealing with the present position of electric lighting and heating, the existing relationship between the ironmonger and the electrical trade, and concluding with suggestions for a closer relationship between these trades. The paper was read in the Supply Department's Show Room, and was followed by a demonstration of lighting and heating appliances.

**English Shorthand Typists from Berlin.**—A considerable number of English lady typists, formerly in the employ of the A.E.G. Company of Berlin, and many of them with a knowledge of French, German and Spanish, in addition to English, and able to write shorthand in all these languages, have been obliged to return to London. Mr. George de Curtis, of the Post Office, Engineering Section, Kingsland Green, N.E., will be pleased to hear from any firms who might desire to avail themselves of their services, as they are seeking situations in this country. In addition to their knowledge of languages, their intimate acquaintance with German commercial methods will also be of great value.



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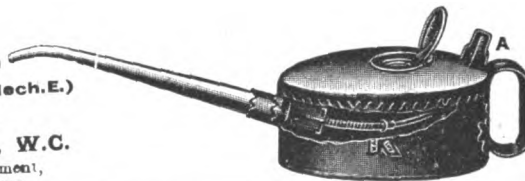
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## FARADAY HOUSE.

### TENDERS INVITED AND PROSPECTIVE BUSINESS

#### Generating Stations, Sub-Stations, Mains, &c.

**Altrincham.**—A loan for street electric lighting purposes is to be taken up.

**Batley.**—A loan of £8,500 is to be taken up for cables.

**London: L.C.C.**—High- and low-tension switchgear and gravity bucket ash conveyor. (See advertisement on another page.)

**Manchester.**—Ten 50,000-lb. water-tube boilers and two 15,000-kw. turbo-alternators are required for the Barton power station. (See advertisement on another page.)

**South Africa.**—The *British & South African Export Gazette* states that large municipal contracts are to be carried out at Cape Town, including £100,000 upon electricity extensions.—An electric lighting scheme is to be carried out at Ladybrand.

**Stockton-on-Tees.**—A supply of three-core cable is required. (See advertisement on another page.)

**Stoke-on-Trent.**—A loan of £2,500 is to be taken up for mains extensions in the Goldenpale district.

**Willesden.**—In order to deal with the Willesden Green district, an additional feeder, at an estimated cost of £4,000, is to be laid.

#### Wiring

**Grimsby.**—Wiring work at Corporation schools during year ending Dec. 31st, 1915. Clerk, Education Offices. Nov. 14th.

**Manchester.**—Old Hall Drive school and caretaker's house, Gorton. Education Offices. Nov. 18th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Bacup.**—Electric lighting of market buildings, police buildings, and Chief Constable's residence.

**Bournemouth.**—Factory, Holdenhurst Road.—Branch library at Westbourne.

**Chester.**—School. Architects, J. H. Davies & Son, 14 Newgate Street.

**Stoke-on-Trent.**—New school at Oakhill (£9,500).

**Wallsend.**—Additions to Infectious Diseases Hospital.

#### Miscellaneous

**Bacup.**—A number of street lamps are to be converted from gas to electricity.

**Edinburgh.**—The Edinburgh & District Tramways Co. require a twelve months' supply of electric lighting stores. General Manager, Nov. 20th.

**Ireland.**—The Sligo, Leitrim and Northern Counties Railway Co. require a twelve months' supply of telegraph materials, lamps, &c. Secretary, Enniskillen. Dec. 1st.

**Spain.**—Three electric cranes are required by the "Junta de Obras del Puerto de Alicante." Further particulars at 73 Basinghall Street, E.C.

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Ipswich.**—The tender of Chamberlain & Hookham has been accepted for a twelve months' supply of meters.

**Maidstone.**—The tender of the Craigpark Electric Cable Co. at £651 for mains has been accepted. The only other tender received was from W. T. Glover & Co., at £700. The new mains are in consequence of additional demands by the Tilling-Stevens works.

**New Zealand.**—The tender of the Brush Electrical Engineering Co. has been accepted for the supply of hydro-electric plant and transformers for Tauranga.

### APPOINTMENTS AND PERSONAL NOTES

Alderman G. H. Robinson, who has been Chairman of the Bradford Electricity Committee, and has been prominently identified with the extensions to the undertakings, has been appointed Lord Mayor of Bradford.

Mr. F. A. Yerbury, who has recently returned from Vancouver, and was formerly with the Mirrlees Watson Co., has become Director and Manager of the Sales Department of the Premier Cooling & Engineering Co., Ltd. (Broadway Court, Westminster, S.W.).

Mr. J. W. Burr, Deputy Electrical Engineer at Croydon, has been appointed Borough Electrical Engineer at Swansea, at a salary of £500 per annum, in succession to Mr. C. A. L. Prusmann. The short list consisted of Mr. Burr, Mr. H. A. Nevill (Chief Electrical Engineer, Wakefield), Mr. S. R. Windle, of Sunderland, and Mr. A. E. Wilson, of Bristol. There were 128 applicants.

Shift engineers are required at the Bedford and Dover Electricity Works. (See advertisements on another page.)

An assistant charge and a junior shift engineer are required in London power stations. (See advertisements.)

A foreman is required in the Tramways Department of the St. Helen's Corporation. (See advertisement.)

Two switchboard attendants, one arc-lamp repairer, one overhead linesman, and one wireman are required in the Newport Electricity Department. (See advertisement.)

Switchboard attendants are also required at the Fulham, Stepney, Birmingham, and other electricity works. (See advertisements on another page.)

A junior switchboard attendant is required for a London sub-station. (See advertisement on another page.)

A sub-station assistant is required at Halifax. (See advertisement on another page.)

## LOCAL NOTES

**Barking: The Ilford Case.**—The Electricity Committee recommends that no action be taken with regard to giving financial assistance in the matter of fighting the Ilford wiring and fitting case, and that the Electrical Engineer make further inquiries and report as to the probable amount of the Council's contributions in respect of the proposed joint Bill of those municipalities requiring wiring or fitting powers.

**Brighton: The L.B. & S.C. Rly. Contract.**—As we have previously mentioned, there has been a certain amount of discontent on the part of some of the members of the Council as to the new contract recently arranged for the supply to the L.B. & S.C. Rly. locomotive shops. These members, who are in a very small minority, succeeded in again raising the question at the last meeting of the Corporation in the form of a resolution asking whether the new terms of the contract with the Railway Co. are likely to give favourable or unfavourable results to the Corporation. It fell to Alderman Gervis, the Chairman of the Electricity Committee, to vindicate once more the action of that body, and judging by local accounts, interest in the matter dwindled towards the end of the debate, as we read in the *Sussex Daily News* that the voting was taken in the presence of only a few members, and that the motion was defeated by 8 votes to 7.

**Derby: Loss of Profits Insurance.**—The Electricity Committee has effected an insurance against loss of profits upon the electricity undertaking arising from fire, boiler, or economiser explosion, or electrical breakdown, and against damages and penalties payable in consequence of failure to supply consumers arising from the same cause. The net annual premium is £88 16s. 6d.

**Dover: Municipal Wiring, &c.**—The Corporation has decided to subscribe £5 towards the costs of promoting a joint Bill by those municipalities requiring hiring and wiring powers.

**London: Islington: Charge for Cinema Supply.**—The Electricity Committee is faced with a difficulty in connection with supply for cinematograph apparatus. At present the charge is 3d. per unit, but the proprietors claim that they should be supplied at the power rate, viz., 1d. per unit. It seems that the Council will be forced to take some action in the matter, as the Gas Light & Coke Co. is offering to install gas-driven generators in these premises, and to guarantee that the total charge shall not exceed 1d. per unit.

**Maidstone: Engineer's Bonus.**—The Council in Committee has decided that the £200 bonus paid to Mr. E. E. Hoadley, the Borough Electrical Engineer, in 1913-14 (see *ELECTRICAL ENGINEERING*, Oct. 22nd, p. 557) has been paid in error, and that Mr. Hoadley be asked to refund it. At the same time, the Electricity Committee is to report as to certain bonuses which it is alleged Mr. Hoadley is entitled to, and which he has not been paid, and also as to a proposed increase in his salary.

**Manchester: The New Power Station.**—It is stated that the Electricity Committee intend to commence work upon the new Barton power station at the earliest possible moment to provide as much work as possible during the winter.

**Oldham: Ornamental Cooling Towers.**—As happened at Edinburgh some time ago, some of the residents near the Greenhill Electricity Works object to the erection of additional cooling towers of the ordinary kind, and have laid before the Electricity Committee sketches of structures intended to be more ornamental. The Committee, however, unlike the Edinburgh Committee, have rejected the proposal on the ground of expense.

**Hiring-Out Motors.**—The Chamber of Commerce have protested against the Electricity Committee supplying motors on hire, and allege that at a recent interview an assurance was given that the Committee would discontinue this practice. The Chairman of the Committee, however, states that the word used was "discontinuance," and not "discontinue," and the case for the Committee is that it never intended not to supply a consumer with a motor if he asked for it, but that the Department would not push the supply in competition with the tradesmen of the Borough.

**Sheffield: Wiring and Fitting.**—The Sheffield electrical contractors are apparently dissatisfied with the manner in which the Corporation is carrying out the agreement come to with the Electrical Contractors' Association after the Parliamentary proceedings last year. It is alleged that the Corporation agreed only to wire to the wall, floor, and ceiling, and that several weeks after this had been agreed to and the Corporation Bill passed, the Town Clerk had

asked for two or three months' further delay before putting the new arrangement into operation. Since then there seems to have been further negotiations, but nothing definite has been arrived at, and the Law and Parliamentary Committee of the Association has been asked to deal with the matter, in order that action may be taken to "put a stop to the existing methods of retail trading." The matter will come before the Corporation in the form of a report dealing with the negotiations between the Association and the Special Committee appointed to deal with it.

**Truro: Electric Supply Scheme.**—Mr. A. P. Trotter, Electrical Adviser to the Board of Trade, held an inquiry at Truro to hear objections to the site of the proposed electric power station. Dr. Purves, the Council's Consulting Engineer, explained that the objections were to probable noise and smell from the works, and said that every protection was being taken to avoid both. The evidence from the ratepayers who appeared was to the effect that their objections would cease if the power station was placed at the other side of the field in which it was proposed to erect it, and the Inspector suggested that the Council might consider this proposal.

**Wrexham: Wiring and Fitting.**—The Town Clerk is to report upon the suggestion of the I.M.E.A. that municipalities should contribute towards the cost of the Ilford case, and also as to the proposed promotion of a joint wiring and fitting Bill.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £52 10s. to £53. (Last week the same.)

**Plant for Sale.**—The Bolton Corporation has for sale a number of second-hand single-phase 83-cycles Brush transformers. (See an advertisement on another page.)

**The British Electrical Export Co., Ltd.**—This Company has been formed under the same directorate as Electrical Installations, Ltd. (27 Martin's Lane, Cannon Street, E.C.), to assist the smaller electrical manufacturers to get in touch with the shipping orders at present on the market that have previously gone to German houses.

**Agency Wanted.**—A Denmark agent is desirous of representing United Kingdom manufacturers of electrical machinery and apparatus. The name is on file at 73 Basinghall Street, E.C.

**Liquidation.**—The Roundhay & District Electric Lighting Co. is to be wound-up voluntarily, having been acquired by the Leeds Corporation.

**Change of Title.**—Ralph H. Haylock & Sons (63 Queen Victoria Street, E.C.) inform us that they are trading for the future under the style of Haylock & Haslett.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Companies Struck Off Register.**—The names of the following will be struck off the register of joint stock companies within three months unless cause is shown to the contrary: Bean Co. (British Electrical & Mechanical Co.); Electrical Power Users' Association; Electric Fire Prevention Appliances & General Mfg. Co.; International Syndicate for Electric Water Power & Public Works Concessions; North Lancashire Tramways Power & Construction Syndicate; Star Electric Light Co.

**Edison & Swan United Electric Light Co.**—There was a net profit of £4,696 for the year ended June 30th, to which is added £1,036 brought forward. This is after providing for both classes of debenture stock and depreciation upon freehold properties and plant. It is proposed to carry forward the whole of the available balance. The directors report very considerable expansion during the past year, and the signs for the next twelve months justify them looking forward to it with considerable confidence.

**Metropolitan Electric Supply Co.**—The interim dividend on the ordinary shares at the rate of 4 per cent. per annum, which was deferred a short while ago in consequence of the war, is now to be paid.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

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THURSDAY, NOVEMBER 19, 1914.

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Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

MR. P. V. HUNTER's address to the Newcastle Local Section of the Institution of Electrical Engineers discussed some problems incidental to supply on a large scale (p. 596).

MR. J. LOWSON's chairman's address to the Scottish Local Section of the Institution of Electrical Engineers dealt with electricity on board ship (p. 596).

IN a Paper on Cables by Mr. C. J. Beaver, read and discussed at the Institution of Electrical Engineers, a new "intersheath" cable for very high pressures was described, and various other matters in connection with cables and cable testing were dealt with (p. 597).

MR. P. P. WHEELWRIGHT in his address to the Manchester Local Section of the Institution of Electrical Engineers spoke of some of the opportunities afforded to the electrical industry by the present circumstances (p. 598).

A REPORT has been issued by a committee in California on the inductive interference produced in telephone and signal lines running parallel to power circuits (p. 598).

THE Preliminary-Grade Paper in Lundbergs' Electric-Light Switching Competition appears on p. 599.

SOME further notes are given on the effect of the war on the loads of the electricity supply stations throughout the country (p. 599).

MR. JUSTICE JOYCE has held that the patent under which the Walsall Hardware Co. manufacture a grip conduit fitting is invalid for want of subject-matter (p. 599).

THE relative merits of copper leaf and composite

brushes for rotary converter slip-rings are discussed in our Questions and Answers columns (p. 600).

A DISCOURSE by Prof. Fleming on the functions of the earth in wireless telegraphy is referred to under "Telephony and Telegraphy," where notes are given on the equipment of the Goldschmidt wireless station at Tuckerton, and on a "wireless spy" court martial (p. 600).

A PAPER on the economic spacing of traction sub-stations was read last week by Dr. H. F. Parshall before the Institution of Civil Engineers (p. 601).

AMONG the subjects of the specifications published last week at the Patent Office are wireless control of torpedoes, protective systems and electrical treatment of birds and animals. C. A. Vandervell & Co. have been successful in an application for suspension of a patent for magneto construction owned by a German. Application has also been made to suspend an electric welding patent. A patent for helical drawn wire filaments by C. O. Bastian is opposed. A patent for graphitising carbon electrodes expires during the week after a full life of fourteen years (p. 602).

SUGGESTIONS are given for ironmongers to take up the electrical business more energetically (p. 603).

AN electric fire pump, some large alternator field regulators, and a new electric stove are described in our Trade Section (pp. 603 and 604).

A LIST is given of new books on electrical and allied subjects which have been published during the last few months (p. 605).

HIGH- and low-tension cable, transformers, and sub-station switchgear is required at Bethnal Green; generating plant by the Barnet Guardians; and expenditures of £17,700 and £6,500 are contemplated at Keighley and Rawtenstall respectively (p. 605).

THE Long Eaton Council has decided not to carry their case with regard to preferential charging to the House of Lords.—We give the history of the Belfast extension scheme showing how the Corporation has ignored the consistent advice of various experts.—The rateable value system has been adopted at Leeds.—Electric cooking apparatus is to be installed in the Willesden schools (p. 606).

**Arrangements for the Week.**—(To-day) Thursday, Nov. 19th. Institution of Electrical Engineers, Dublin Section, at Royal College of Science. Chairman's Address, by Mr. G. Archer. 8 p.m.

Friday, Nov. 20th. Institution of Mechanical Engineers. "The Effect of Vacuum on Steam-Turbines," by G. G. Stoney, F.R.S.

Wednesday, Nov. 25th. Institution of Electrical Engineers, Birmingham Section. At University. "Power Plant Testing," by W. M. Selvey. 7.30 p.m.

Thursday, Nov. 26th. Institution of Electrical Engineers. "Power Plant Testing," by W. M. Selvey. 8 p.m.—Greenock Electrical Society, 21 West Stewart Street. "The Oscillograph," by J. A. Kinnaird.



## PROBLEMS OF GENERATION AND TRANSMISSION ON A LARGE SCALE

THE Chairman's Address of Mr. P. V. Hunter to the Newcastle Local Section of the Institution of Electrical Engineers was devoted to some of the problems which arise with the prevailing tendency of electric supply and distribution being carried out on a larger and larger scale. Some of the most important of these were due to the mechanical forces experienced by circuits carrying heavy currents. As the magnitude of such stresses was proportional to the square of the current, they might be quite inappreciable with normal currents, but of serious moment in event of an abnormal rush of current amounting to several times the normal load. Trouble was first experienced due to this cause in the end windings of turbo-generators, which had been seriously distorted and damaged in this way by sudden short-circuit currents. The effect, however, depended largely on the nature of the short-circuit; a growing fault sometimes allowed the armature current to demagnetise the field sufficiently to avoid excessive currents in the stator windings. The primary precaution was to brace the end windings in a way to enable them to withstand the mechanical forces. Sometimes reactance had been introduced in series with the generator windings to reduce the maximum short-circuit current; or the step-up transformers, where these were used, were made of specially high impedance; but there was still the objection that if these devices broke down, the generator was still unprotected. No really satisfactory way of incorporating sufficient reactance in the stator windings themselves had been evolved, although there was a tendency on the part of some designers to depart from the ideal winding of one bar per slot. This, however, was attended by other disadvantages. "On the whole," continued Mr. Hunter, "it seems justifiable to express the view that with the precautions discussed above the mechanical shock on short-circuit is no serious obstacle in the construction of large generators, and it does not appear at all probable that it will in any way limit the maximum size of generators which can be satisfactorily constructed."

Transformers were subjected to great stresses due to the same cause to an even greater extent, but, owing to their construction, were better able to withstand them. It had been found, however, from experience that, although a transformer may be so constructed and braced that when first installed it is fully capable of withstanding a short-circuit, it may not be in this condition after it has been in service for a few months. This particularly applies to oil-cooled transformers, where apparently there is some slight shrinkage of the insulation due to the action of the hot oil. Many existing transformers have inadequate provision against these mechanical stresses, but that more trouble has not been experienced is probably due to the fact that the generating plant was not able to maintain the full primary pressure on short-circuit. There is little doubt that many failures of current transformers have been due to the same cause. Another way in which minor forces have manifested themselves is in the spontaneous opening of disconnecting switches of the knife type on heavy current rushes. Indeed, no conductors in large stations are immune from these forces, and measures must be taken to provide against damage. One precaution that may readily be taken when the conductors are in the form of copper strip is to arrange them so that the greatest dimension of each conductor's cross-section is in the line of the force. This obvious precaution gives greater rigidity, but is often neglected.

In addition to precautions in the nature of mechanical construction to enable these stresses to be taken without harmful strain, it is desirable to endeavour to reduce their magnitude, and a good deal can be done in this direction by the use of reactances to limit the short-circuit currents. This has been discussed a good deal lately, and in some cases the indiscriminate use of reactance has been advocated in a manner which, if adopted, would make commercial engineering practically impossible. So far as generators are concerned, the addition of even a comparatively large reactance does not materially affect cost or efficiency, but the introduction of reactances between bus-bar sections and on feeders had the disadvantage of entailing too much sub-division of the network. The objection to the use of reactance at the power station end of feeders is the increased voltage drop. This is not serious in undertakings such as were common in America where synchronous converting plant enable a high power factor to be obtained, but is more serious in this country, where the tendency is to give supply as alternating current without conversion. Mr. Hunter suggested that the most satisfactory solution to the problem in this case was to put on each feeder a voltage regulator which might embody the necessary reactance.

## ELECTRICAL EQUIPMENT ON BOARD SHIP

THE Chairman's Address of Mr. J. Lowson, delivered at Glasgow on Nov. 10th to the Scottish Local Section of the Institution of Electrical Engineers, was devoted to a study of the applications of electricity on board ship. Progress had been continuous ever since Edison, in 1880, had fitted 115 10-c.p. lamps on the s.s. *Columbia*, supplied by two dynamos belt-driven from a countershaft. Some months later the Cunarder *Servia* was fitted with a 10-kw. installation, and in 1883 the *Nonpareil* was electrically lit by J. H. Holmes & Co. The White Star liner *Majestic*, of 1899, had 1,200 16-c.p. lamps, and at that time it was considered remarkable that the exposed navigation lights and compass lights were electric. The first insulated wires used for ship lighting were covered with cotton cloth and white lead, and were provided with a further protection of rubber tubing when passing through specially damp places. There had been some difficulty in finding wires and fittings that would not be affected by sea-air or sea-water, and no matter how good the insulating material and armoured protection, if the wires are not well fitted by competent men deterioration quickly sets in. An electrical installation, however, carried out in a proper manner, should last as long as the hull of the ship. Few electric motors were used on board ship ten years ago, and a decided advance was made on the *Lusitania* and *Mauritania*, in 1907, when electric drive replaced steam engines for force-draught fan driving, and in all motors aggregating 2,133 h.p. were installed on each ship. Even the life-boat winches were worked electrically, but electricity was not used to any great extent for cooking and heating. There was still a large field for future extensions in this direction, where its advantages render its universal adoption only a matter of time. The thermo-tank system of ventilation, with electrically-driven fans, was very largely in use, and an electric water-heating device for cabin basins, &c., had been introduced by a Glasgow firm. Although it was a difficult matter to oust the steam winch from its present position, Mr. Lowson looked forward to the time when the electric winch would be so improved as to be preferable on all counts, in view of the fact that electric cables had many advantages over steam pipes on board ship. Where the forced-draught fans were driven electrically, the use of electric power for winches, cranes, &c., in port would greatly improve the load-factor. The advent of oil-motor-driven ships would make electrical auxiliaries imperative; but at least one steam-propelled ship, the G.S.N.Co.'s *Fauvette*, had recently been equipped with a complete set of electric cranes for discharging and loading cargo. The Chairman then referred to Mr. H. A. Mavor's experiments in electrical marine propulsion on the Tyne, but regretted that the enterprise could not be proceeded with on the lines intended, owing to rise in the price of fuel oil.

The latter part of the address contained an account of the electrical equipment of the *Aquitania*, which involves generating plant consisting of four 400-kw. turbo-generators for 225 volts D.C., with static balancers for three-wire distribution, and a 30-kw. emergency Diesel-engine-driven set, 200 miles of cables and a power equipment of over 200 motors, aggregating 2,590 h.p. (including 700 h.p. for forced draught), and varying from  $\frac{1}{2}$  to 50 h.p. Over 10,000 metal-filament lamps are used for lighting, including ten 300-c.p. life-boat lamps along each side. There are also four 100-ampere searchlights. Other applications of electricity are in connection with the fire alarms, watertight doors, submarine signalling, sounding machines, navigation and side-light indicators, signalling lamps, whistle control and helm indicators, revolution and stoking indicators, clocks, telephones, and bells, and the wireless telegraph system, including wireless installations on two motor life-boats.

**The British Electrical Federation and the War.**—As we have already pointed out the British Electrical Federation Mutual Aid Fund has been inaugurated in order to assist dependents of the men employed by the various companies affiliated to the Federation who are at present with H.M. Forces. The Federation urges all its eligible employees to enlist, and pending the decision of the Government on the question of increased pensions, the allowances to dependents who have lost their lives in action are being continued. Out of 7,432 men no less than 757 have already enlisted. These figures do not apply to the Metropolitan group of companies, including the Underground Railways, for which the T.O.T. Mutual Aid Fund has been established. We regret to notice that already four men have lost their lives. There is the substantial balance in hand of £621, and the balance of weekly income over expenditure is at present approximately £80.

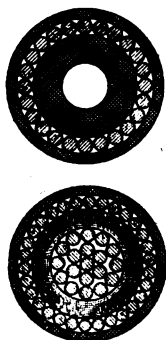
**The Physical Society.** The Council have decided not to hold the usual Annual Exhibition of Apparatus during the present session.

## CABLES

A PAPER on "Cables," by Mr. C. J. Beaver, of Messrs. W. T. Glover & Co., was read at the Institution of Electrical Engineers in London on Thursday, and at the Manchester Local Section on Tuesday; it will also be discussed in Edinburgh on Jan. 12th.

Dealing first with extra high pressure cables, Mr. Beaver commented on the fact that cables up to 11 kilovolts pressure were standardised by the Engineering Standards Committee, so that it was only for higher pressures that there was an incentive to give attention to potential gradients, as there was greater margin for competition in unstandardised cable. From 6 to 11 kilovolts, however, he said that the opportunity for re-designing dielectric thicknesses had been apparent years ago, but nobody had had the courage or the opportunity to reverse the practice of increasing the thickness of the dielectric as the size of the conductors increased.

For cables for from 50 to 100 kilovolts the author pointed out that a tubular conductor is necessary. Fig. 1 shows such a conductor designed for a 50-kilovolt cable, allowing a maximum stress in the dielectric of 50 (R.M.S.) kilovolts per cm. To give the necessary diameter and smoothness of surface it is made up of an inner lead tube 0.256 in. bore and 0.14 in. radial thickness, surrounded by twenty-four copper wires 0.082 in. diameter, which are covered by a lead sheath 0.05 in. thick, bringing the total diameter of the conductor to 0.80 in. Fig. 2 shows an alternative pattern for cables protected on the split conductor system (ELECTRICAL ENGINEERING, Oct. 22nd, p. 551); it is made up as follows: Inner conductor 19/15 S.W.G.; paper, 0.117 in. radial; second



FIGS. 1 AND 2.  
(Actual size.)

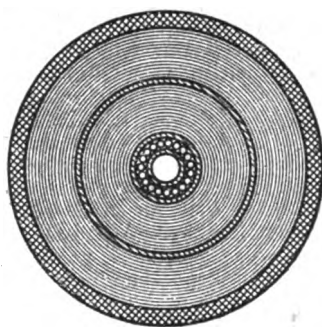


FIG. 3.  
(Half actual size.)

conductor, 30 × 0.058 in.; outer lead, 0.05 in. radial; complete diameter, 0.80 in.

In designing the dielectric, the author prefers to interpose an intermediate metallic sheath in the dielectric instead of insulating with layers of varying specific inductive capacity. The "intersheath" is anchored at a suitable predetermined potential by a transformer tapping in the case of A.C. cables, or by a tapping from the generators or by connecting resistances in parallel in the case of D.C. He prefers one intersheath instead of two, as, although the latter introduces a small saving in the total diameter of the cable, this is more than compensated for by the extra complication of the apparatus which would be required to keep two intersheaths at the proper potential. Fig. 3 shows a single intersheath cable, of which commercial lengths have been made and tested with satisfactory results. It is designed as a member of a 100-kilovolt three-phase line, and for a breakdown pressure of 250 kilovolts per phase. The maximum stress in the dielectric at working pressure is 52 kilovolts per cm. The dimensions are as follows: *Conductor*: Inner lead tube, 0.27 in. bore and 0.06 in. radial thickness; 19 × 15 S.W.G. copper wires; outer lead tube, 0.05 in. radial. *Dielectric*: Paper, 0.545 in. radial; lead intersheath, 0.05 in. radial; second paper sheath, 0.565 in. radial. *Outer Lead Sheath*: 0.16 in. radial. Overall diameter, 3.27 in. He regards a breakdown stress of 250 R.M.S. kilovolts per cm. as the maximum commercial figure in the present state of the manufacture of paper cables, and takes from 120 to 150 as a safe figure for the purposes of the guaranteed tests. As these are likely to be two-and-a-half to three times the working pressure, this gives a working maximum stress of about 50 kilovolts per cm.: at 60 to 70, the heating due to dielectric hysteresis would be appreciable.

The author insisted on the importance of the time element in pressure tests, as sometimes cables break down near the expiration of the standard half-hour period. He mentioned the divergence of views between Addenbrooke and Rayner

on the one hand, and Hochstädter on the other hand, as to whether the dielectric broke down gradually or suddenly, and seemed inclined to the latter view, expressing the opinion that the gradual increase in the current through the dielectric observed by Rayner had been the effect of the rise in temperature on the dielectric. In connection with the test under water, he pointed out that it takes very long for the water to penetrate thick insulation, and owing to the path of least resistance to the water being longitudinal, there is a risk of the moisture travelling a long way along the cable before it is detected. He has used in some cases, therefore, a "test sheath," insulated only from the lead covering by a comparatively small radial thickness of insulation, so that a defect in the lead sheathing may be detected at once.

In the second part of the Paper the author touched on the method of insulating paper cables, and emphasised his point of view that a higher insulation did not necessarily indicate overheating in manufacture, as, in a certain make of cable in which the paper is applied to the cable after impregnation, a higher insulation, he said, was obtained than in those in which the impregnating process took several hours after application of the paper. He strongly advocated the impregnation of the paper in sheet, before its application to the cable.

The necessity for allowing for expansion and contraction of laid cables was referred to, and the point that much higher current densities can be permitted in underground cables than those allowed by the Institution Wiring Rules. The importance of using ferrules designed in bold curves and a smooth finish after soldering, in conductor joints in E.H.T. cables was alluded to, and the author expressed his preference for the use of porcelain spacers for insulation rather than wrappings of tape and paper. On the subject of mechanical faults, he mentioned a case in Manchester where it had been found that the pounding of heavy traffic had depressed the joints between the lengths of troughing, and caused faults; cables on the solid system are particularly susceptible to this form of damage.

Dealing with rubber cables, he classed deterioration of the insulation as a superficial effect, and inferred that E.H.T. cables with thick dielectrics would be more durable.

The last part of the Paper was devoted to vulcanised bitumen cables, and the author described in detail the various mechanical tests to which the insulation of these is now subjected. After describing at length an interesting investigation upon some failures of V.B. cables in the tropics, he came to the conclusion that leakage current was necessary in the first instance to produce softening of the dielectric. Finally, he described successful experiments in which the addition of high-grade vulcanised rubber, incorporated in the vulcanised bitumen as a filling, had a distinctly beneficial effect in preventing the same class of softening as was produced by exposure to steam, and mentioned the addition of 5 to 10 per cent. of the rubber substance as being sufficient under the worst conditions of practice.

The discussion in London was chiefly devoted to the "intersheath" cable. Dr. Alexander Russell (Faraday House) said that he was now convinced that this was a better solution of the problem than the Jona method of grading, which had the disadvantage that it assumed that the specific inductive capacity of the dielectric remained constant. He pointed out that the capacity currents in the outer sheath would be large, but so far as the intersheath was concerned, the currents on the two sides of this would largely neutralise one another. For long cables, as had been explained to him by Mr. L. B. Atkinson, the capacity current in the outer sheath could be dealt with by feeding current into it, but for short lengths this was unnecessary. He regarded the method particularly suited to H.T. D.C. cables. Mr. Rayner (National Physical Laboratory) suggested paper or something less expensive and heavy than lead for the internal tube of the cable. He also expressed his disagreement with the author's interpretation of his breakdown experiments on cables and maintained that the effect noticed was a real drop in ohmic resistance and not a temperature effect. Mr. P. V. Hunter (Newcastle-upon-Tyne Electric Supply Co.) thought that the cable described would be limited for various reasons to connections to the ends of overhead lines and similar applications. For long cables, there would be trouble due to the high capacity current, increased reactions due to the distance between the conductors, as single cables would have to be used, and a revival of the "Ferranti effect" in which the reactance voltage due to the leading current added considerably to the working voltage. Moreover, if the lead sheaths of two cables in a three-phase system touched, heavy currents might flow. He also feared that the auxiliary apparatus to "anchor" the potential of the intersheath would make the conditions worse from the point of view of possible surgings. Prof. Schwartz said that as a result of seven months' experiments in conjunction with Dr. H. P. Stevens, he had found that the natural deterioration of plan-

tation rubber was no greater than that of fine hard Para. Mr. F. C. Raphael (Editor of *ELECTRICAL ENGINEERING*) explained that a breakdown of the author's intersheath cable at any spot might be expected to cause breakdowns in other points of the cable, due to full pressure being established between the intersheath and the core or the outer lead, and heavy currents might also, in such circumstances, pass along the intersheath and melt it, so damaging considerable lengths of cable. A single fault could be localised with an accuracy of one yard per mile of cable, but it was impossible to localise accurately several simultaneous faults in the same cable. An advantage of the split conductor system of mains protection was that a faulty cable would be automatically isolated before the conductor had had time to burn through, so the localisation would be possible. Mr. Brooking (St. Helens Cable Co.) said that the natural deterioration of vulcanised rubber did not occur in a certain class of cable, which was "as permanent as the pyramids of Egypt." Mr. C. P. Sparks (County of London Electric Supply Co.) referred to the good results obtained with the vacuum cable joint; he objected to the mechanical weakness of porcelain spacers and preferred a joint with carefully prepared insulating material, covered by a wiped sleeve joint. He disagreed with the last part of the Paper. Vulcanised bitumen, he said, had proved a treacherous material in the past, and should therefore only be used in special circumstances. Prof. J. T. Morris, Mr. Addenbrooke, Mr. Wordingham, and Mr. S. W. Melsom also spoke briefly. In his reply to the discussion, Mr. Beaver said that many of the criticisms had been made on the assumption that the intersheath cable was proposed for long distances, but so far it was only being employed for short ends connected to overhead lines.

## THE ELECTRICAL INDUSTRY AND ITS OPPORTUNITIES

IN his inaugural address to the Manchester Local Section of the Institution of Electrical Engineers, Mr. P. P. Wheelwright dwelt on the business side of the Institution's work, urging a widening of its field of operation, particularly as regards improving the status and remuneration of electrical engineers. Turning to the influence of the war on electrical industry, he encouraged all effort to take the opportunity now presented of securing trade which formerly passed to Germany, and the directing of patriotic energy into defence of our industries as well as our country. He looked forward to economic advantages in the further adoption of electric traction on railways, and put in a plea for a sounder basis in the specifying and purchase of electrical plant, with more give-and-take between the purchaser and the manufacturer. He also spoke of the economies to be effected by electrical driving, its advantages in the way of smoke abatement, and the keynote of his address was the appeal to seize all the opportunities of the present for effecting the progress of the British electrical industry, and the full utilisation of the benefits it can render available in other spheres of activity.

**The Lighting of the Lecture Theatre at the Institution of Electrical Engineers.**—As Sir John Snell announced at the meeting last Thursday, experiments are being made regarding improvements in the lighting of the lecture theatre at the Institution of Electrical Engineers. The original lighting installation, which is on somewhat unusual lines, was described in *ELECTRICAL ENGINEERING*, Vol. VI., p. 728 (Nov. 17th, 1910), and, as those familiar with the building will know, consisted of indirect lighting by metal-filament lamps in the cornice, with the addition of four quartz mercury vapour lamps above the glass "lay light," forming the main part of the ceiling. It has been customary while the lantern is in use to extinguish only the indirect lights, as the peculiar coloured light from the mercury vapour lamps interferes but little with the definition on the screen, while sufficiently bright to read by and to take notes. The experiments now being made are in the direction of replacing some of these by lights of other natures, and trying the effect of various coloured screens. The difference in the illumination could not but be apparent to those who were at the meeting, and the illumination of the hall has been greatly improved, both in intensity and character. We are informed, however, that no final result has been arrived at, and that the arrangement then used will not necessarily be adopted. For this reason we are unable to give details of the lamps that are being tried until the experiments are complete.

**"The Central."**—Among the articles in the current issue of the magazine of the old students of the City and Guilds Engineering College is one by Mr. A. C. Branch on the commercial aspect of Diesel engines. The doings of old Centralians are chronicled in the usual notes, but there is curiously little as to their participation in the war.

## INDUCTIVE INTERFERENCE OF PARALLEL CIRCUITS

A REPORT has been issued by a Committee of the Railroad Commission of the State of California, U.S.A., which was appointed to investigate the question of inductive interference between different classes of parallel circuits. After a considerable amount of experimental work, the Committee summarise their conclusions as follows:—Interference to telephone circuits under normal operating conditions of power circuits arises almost wholly from the harmonic voltages and currents of the power system. The effect of induction of the fundamental frequency on telephone circuits is comparatively unimportant unless it is of magnitude sufficient to constitute a physical hazard. Interference to telegraph and other signalling circuits is due principally to the fundamental and lower harmonics. The power circuit currents and voltages may be divided into two factors: balanced and residual, of which, for equal magnitude, the latter in general produce the greater inductive interference. Inductive interference to communication circuits, arising from the balanced voltages and currents can in a large measure be prevented by means of an adequate system of transpositions applied to both power and communication circuits (assuming the latter are metallic) and located with due regard to each other. Abnormal conditions and at times switching operations produce transient disturbances of a very severe character.

A code of rules is recommended for the avoidance of harmful inductive effects. Some of the chief points to which attention is paid are the following: Every effort should be made to avoid parallelism, but parallel lines will be permitted if various precautions are taken. The minimum horizontal separation in such cases should be at least equal to the height of the power line, and the currents in the phases of the power circuit must be as evenly balanced as possible. An adequate system of transpositions must be provided both for the power and communication circuits to balance the electrostatic capacities to earth of its several conductors. No earthed single-phase or earthed neutral three-phase transformer connections may be employed, and only oil-switches with the three poles opening simultaneously may be employed. Power circuits must not continue running under abnormal fault conditions, and certain precautions and procedure are recommended in such cases. Care must be taken to eliminate disturbances so far as possible when charging electrolytic lightning arresters, and the wave forms must be as near to a pure sine curve as possible. With regard to single-phase railways, the report continues as follows: "It is recognised that railroads operating alternating-current trolleys with ground return create serious inductive interference with parallel communication circuits. In the present state of the art no means for completely overcoming inductive interference from such parallels is known."

## A GRIP CONDUIT FITTING PATENT ACTION

JUDGMENT was given by Mr. Justice Joyce on Tuesday in the action by the Walsall Hardware Manufacturing Co. against the Stella Conduit Co., Ltd., dealt with on p. 560 of our issue for Oct. 29th. The action was for alleged infringement of Patent No. 18,375/05, for a grip conduit fitting. The Stella Co. admitted infringement, but claimed that there was no subject-matter in the Patent, as the device was nothing more than the grip universally used on bicycle heads. On the other hand, for the plaintiffs it was contended that the patent was a new application of this device, inasmuch as it applied the grip to two ends of a tube, whereas in the bicycle it was only applied to one.

Mr. Justice Joyce, in his judgment, said the main question before him was whether it was a patentable invention to place this common arrangement at both ends of a tube, socket, bend, &c., and he found it impossible to come to any other conclusion than that there was nothing in the patented article in this case which could be termed invention within the meaning of patent law. He therefore must hold that the patent was invalid for want of subject-matter, and dismissed the action with the usual costs. A stay of three weeks was granted on the usual terms to give an opportunity for this judgment to be appealed against.

**An Electrically Propelled Warship.**—As a result of the very successful trials of the U.S. naval collier *Jupiter*, which is fitted with electrical transmission for main propulsion, and has shown remarkable results on an extended voyage, the U.S. Navy Department announces that the new super-Dreadnought *California*, with a designed speed of 21 knots, is to be electrically propelled. This will be the first warship to be equipped on this system, and the result will be watched with great interest.

## LUNDBERGS' ELECTRIC-LIGHT SWITCHING COMPETITION

(For Initial Announcement, and Particulars of Prizes, etc., see "Electrical Engineering" of Nov. 12th, p. 587.)

### RULES TO BE OBSERVED IN WORKING PAPERS.

1. Three Papers are set: Preliminary, Intermediate and Advanced. Any one of the three papers may be taken, but not more than one. The Preliminary Paper is published below; the Intermediate Paper will appear in "Electrical Engineering" of Nov. 26th, and the Advanced Paper on Dec. 3rd.
2. Competitors who have passed the Preliminary Grade on a previous occasion must take either the Intermediate or Advanced Grade. Those who have passed the Intermediate Grade must take the Advanced Grade. Those who have passed the Advanced Grade cannot enter.
3. When figure or page numbers are mentioned in the questions, they refer to the booklet "Lektrik Lighting Connections" (new 3rd Edition \*); by the help of which the paper may be worked.
4. Each answer must be done on a separate sheet (or sheets) of paper, on one side only; and each sheet must bear the writer's full name and address. It is not necessary to paste the questions on the answer paper.
5. Each answer must be numbered to correspond with the question.
6. Any competitor who does not wish his own name to appear in the published results should give a *nom-de-plume* or fancy name for this purpose. In all such cases, however, Rule 4 must be adhered to. In the published results only the names (or *noms-de-plume*) and the towns (not full addresses) of successful candidates will be published.
7. Answers to Papers must be addressed to the Editor of "Electrical Engineering," 203, Temple Chambers, London, E.C. Those from competitors living in or near the United Kingdom must reach the Offices of "Electrical Engineering" on or before Jan. 11th next, and the results will be published in "Electrical Engineering" of Feb. 25th, 1915. Answer Papers from far-off competitors must reach the Offices of "Electrical Engineering" by June 1st, 1915, and the results will be announced later.
8. The answer papers sent in will not be returned.

### PRELIMINARY-GRADE PAPER.

As many as possible of the following eight questions should be answered.

1. A "Twinob" switch may be so connected to two lamps (or groups of lamps) A and B, that B cannot be lighted without A, although A can be put on alone. Sketch the connections.  
Can you think of any use for this control?
2. Before wiring-up, it is necessary to ascertain which is the feed terminal of an "All-or-Part-and-off" switch. How would you do this? What would be the result of connecting the feed wire to the wrong terminal?
3. Make a plan of a large room with two cupboards in it, and show how you would run the wires in the room for Circuit No. 5.
4. The switches in Figs. 72 and 91 are mounted side-by-side at the door of a room, and all the lamps are fed through one ceiling-rose. Three of the lamps are on a pendant 4-light fitting, and the other is on a table standard connected through an adapter to one of the lampholders on the pendant. Sketch the connections.
5. Three lamps on a pendant hung from a ceiling-rose are controlled by a two-way switch fitted to the lower part of the pendant, and by another two-way switch at the door. Sketch the connections.
6. A group of lights is controlled by a single-way cord-pull switch like that in Fig. 23. It is now desired to replace this switch by a two-way actuated in the same manner; and to fix a second two-way switch and an intermediate switch to act in conjunction with the first. The two additional switches are to hang from ceiling-roses, and original wiring is not to be disturbed. Map out the connections.
7. Rearrange Fig. 91 to provide for the looping-in of the distribution box leads to the rose, for separate wires to the switch, and for the earthing of the pendant fitting on which the lamps are mounted.
8. Unless the moving contact-arms of a two-way

switch are insulated from each other, as in the Lundberg "Pivot" and "Imp" patterns, (a) the switch has generally only a single instead of a double break, and (b) the arm which is "off" is liable to develop an "earth" through the cover, or to make the latter "live." Prove these statements.

N.B.—Samples of any of the switches, &c., referred to can be supplied to competitors at the average rate of 2s. 6d. each. Requests for samples must be accompanied by remittances, and must be sent direct to A. P. Lundberg and Sons, Switch Specialists, 477-489 Liverpool Road, London, N. The money will be returned when the samples are sent back in good condition. Mention Competition when ordering. The above is an outside price as regards most switches, and a considerable reduction can generally be made when competitors desire to retain the switches.

## THE EFFECT OF THE WAR ON THE ELECTRICITY SUPPLY INDUSTRY

SINCE publishing our article on this subject last week reports have come in from some other centres.

*Birmingham.*—There was a falling off in the number of units sold in August and September, but in October the totals were practically normal again. Although the traction units sold for October had fallen to 1,964,917 as compared with 2,049,088 in October, 1913, the total units sold during October, 1914, was 7,089,387 as against 6,415,592 in October, 1913. The lighting units have, as might be expected, not shown their normal increase this autumn, but a large number of power users are working day and night on Government contracts.

*North Metropolitan Electric Power Supply Co.*—The chief drop has been in current sold for electric traction. For the week ending August 1st, the number of units sold for traction were 3.5 per cent. above those for the corresponding week last year, but for the week ending October 31st, they were 8 per cent. less than the corresponding week last year.—The lighting and power supply has, however, increased, so that the total falling off is only 3.2 per cent. This means, however, a considerable increase in the lighting units, as the majority of the units sold are for traction purposes. The increase in lighting and power, although great, has been less than it would have been normally.

*West Ham.*—The consumption for public lighting has been largely reduced, but when war broke out, the Electricity Department were engaged in replacing all the old lamps by an improved system of incandescent lighting on tramway poles. The result is that, although the normal lighting has been immensely reduced by the restrictions of the authorities, there has been a safer illumination than before in many of the principal thoroughfares from the point of view of traffic. Private lighting only shows a moderate advance, owing to the decrease in outside shop lighting, but power, heating, and cooking continues to increase satisfactorily. Whilst a few factories have been adversely affected, the majority have become distinctly busier. The total figures for consumption, however, are not much, if any, below the normal rate of advance.

*Gillingham (Kent).*—As this is a military and naval town, it was recently put under very stringent regulations with regard to visible light, otherwise things are normal. The power load is steadily increasing, and applications from new consumers are quite up to the usual number.

*South Shields.*—For the last three months the lighting units are down 6 per cent., the D.C. power and traction units are up 5 per cent., and the total units are up 0.7 per cent, compared with the same period last year. The normal increase all round would have been about 10 per cent. Owing to early closing and restrictions as to public lighting, the lighting supply has increased only 2½ per cent. One hundred arc lamps are out of commission, and the street lighting is dependent on incandescent lamps on the arc lamp standards. The whole of the front of the town overlooking the sea is in absolute blackness all night long.

*Eastbourne.*—For September the output was 9 per cent. less, and for October 8 per cent. less, than last year. The sea front is very effectively darkened, but chiefly by blackening the globes, as only half the lamps are shut off. The remainder are switched off at 10.30 p.m. instead of burning all night.

**Responsibility for Junction Box Explosion.**—Last week an appeal was heard by Justices Darling and Sankey in a case brought by a Mr. Goodbody against the Poplar Corporation for damages for injury due to an explosion of gas in a junction box. The case had gone against the plaintiff in the County Court. Mr. Justice Darling found that the damage was due to the presence of gas in the box over which the defendants had no control. Mr. Justice Sankey agreed, and remarked that the plaintiff might have proceeded against the Gas Co. The appeal was dismissed with costs.

\* For the convenience of our readers we have arranged to keep a stock of this Booklet, and a copy will be sent by return of post on receipt of seven penny stamps. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203, Temple Chambers, London, E.C.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,417.

I wish to construct a suitable search coil for fault localising, and should be grateful if anyone will furnish me with particulars of wire to be used and the gauge and length required to give an audible buzz when passing about 10 amps. through the fault by means of an interrupter, and also the resistance of a "buzzer" to suit.—"ALPHA."

(Answers must be received not later than first post Thursday, Nov. 26th.)

### ANSWERS TO No. 1,415.

The querist is interested in the running of rotary converters, and would like to hear of the experiences of station engineers with regard to the behaviour of the A.C. brushes and slip rings.

In the last year or two the tendency has been to use brushes of a metal-carbon mixture in preference to the copper-leaf brushes invariably fitted to the earlier machines. Some of these earlier machines, if not most, ran for many years before renewal of the slip-rings became advisable, but the writer has known of several machines, using composite brushes, where the wear has become a serious matter. It would be interesting to hear the opinions of engineers with both types.

The trouble, if it is general, may not be due to the material of the brushes, as excessive current density may count for a great deal, but there may be something in it, as the writer believes that there are one or two corporations who insist on having copper-leaf brushes. A. G. T. C.

The first award (10s.) is given to "C. S. B." for the following reply:—

Every station engineer who is in charge of rotary converters is fully alive to the necessity of paying particular attention to the slip rings to ensure satisfactory running. The writer has had experience with the use of both types of A.C. brushes, viz., copper foil and metal-carbon composition, and is decidedly in favour of the latter type.

Copper foil brushes, in many cases, work very satisfactorily, but in practically all these instances great care is taken to clean and trim the brushes regularly. The writer examined recently a 600-kw. rotary-converter, fitted with copper foil brushes, which has been working practically continuously for nearly four years and the slip rings have not yet been turned up, the maximum wear being less than  $\frac{1}{4}$  in. In this case the brushgear is fitted with small lubricating cups, one to each ring, and oil is fed by means of wicks. It will usually be found that where oil or other lubricant is applied to the rings at irregular intervals, and dust is allowed to get between the faces of the copper brushes and the rings, the wear will be excessive. If the rotary is started up by a controller connected to tappings on the transformer, the difficulties of keeping copper foil brushes in order are greatly increased; the rush of current at starting and when switching to "full on" position frequently causes momentary sparking and pitting of the rings. With regard to the use of metal-carbon composition brushes, when excessive wear is taking place, it will be found that this is more often due to excessive brush tension, or else too high a current density resulting in the

rings running hot, than to the actual composition of the brush. A special grade of copper morganite brush, designed for high speed rotaries, is on the market. The normal current density of this brush is not as high as the metallic type for ordinary slip rings, but the coefficient of friction is lower. The writer believes that the most suitable design, both from the point of view of attention required and life of rings, is box-type carbon or graphite-metal composition brushes, working at a fairly low current density, and with just sufficient brush tension on the rings to prevent sparking.

The second award (5s.) is given to "A. J. B.," who writes as follows:—

The relative merits of copper leaf and the more modern composite carbon brush is a much contested point, and good results have been obtained with both types.

Personally, the writer favours the carbon and copper type manufactured by the Morganite Crucible Co. Properly designed with regard to current density, these brushes give excellent results. The trouble experienced by some users is a fine copper dust from the brushes, which is drawn into the rotor connections, and if not frequently cleaned will give rise to serious trouble. This trouble can, however, be removed by the application of a little vaseline every few hours to the slip rings. When machines are fitted with an oscillator on the shaft, no trouble will be experienced with uneven or rapid wear of the rings.

The older form of copper leaf brushes, according to the writer's experience, result in wearing the ring unevenly, due to the fact that it is almost impossible to obtain uniform tension over the whole surface. An oscillating shaft will not remedy this, although it greatly improves wear on both brushes and rings. The best method, when using this type of brush, is to have a double set of brushes and change them, say, twice a week, trimming a new face and thoroughly cleaning each time. Machines with this type of gear are usually fitted with lubricators. The best oil for the purpose is a light thin oil; that which is supplied for transformers is found to give very good results.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

At a meeting of the Wireless Society of London, last Friday, Prof. J. A. Fleming gave an Address on "The Function of the Earth in Wireless Telegraphy," illustrated by experiments for the performance of which it had been necessary, as Mr. A. A. Campbell Swinton, who was in the Chair, announced, to obtain the permission of the Government, even though they involved no transmission or reception of external messages. Speaking after the Address, the Chairman referred to the question of watching for attempts at wireless communication by unauthorised persons, and mentioned an offer of assistance which their Society had made. He did not, when making the offer, know what was being done by the authorities in the matter, but had since been informed of the arrangements, which he declared were admirable in their sufficiency. There was, however, another way in which their members could help. The police were naturally handicapped in their work of suppressing illicit wireless by the fact that many members of the force did not know wireless apparatus when they saw it, and he was now preparing lists of members of the wireless societies all over the country for the use of the police, so that they could at any time and place readily invoke the skilled assistance that they were in need of. He had already done some work of that nature himself for Scotland Yard, and found it quite exciting.

Prof. Fleming, in his Address, investigated the depth to which electric waves can penetrate substances of different conductivity and permeability, illustrating the very skin-deep nature of high-frequency conduction by experiment, and the way magnetic materials absorb the oscillations. Thus the thin zinc coating produced by galvanisation was sufficient to turn iron from an unsuitable to a suitable material for an aerial. The materials forming the earth's crust were mostly of the nature of poorly conducting dielectrics, allowing greater penetration of the waves, but producing horizontal as well as vertical attenuation greatest with dry soil and least with sea-water. Recent research had shown that the conductivity of most substances was, however, higher for high-frequency A.C. than for D.C., and probably vastly so at radio-telegraphic frequencies. The foot of the radiated wave where it penetrated the earth was refracted, a considerable horizontal com-

ponent was produced which gave rise to a surface wave which he suggested might contribute to the result as well as the aerial wave. Indeed, the phenomena of antenna-less reception might be due to this cause alone. A simple experiment illustrated this aspect of radio-transmission. The lecturer also dealt with the curving of long-distance waves to follow the curvature of the earth, attributing it in a small degree to diffraction and largely to the presence of light gases, such as hydrogen and helium, in the upper strata of the atmosphere, which caused the top of the wave to travel faster than the foot. The ionisation of the upper air might also, as suggested by Dr. Eccles, have something to do with it. Indeed, the circumstances fitted together in a way which pointed to the earth being the only planet upon which long-distance wireless telegraphy was possible.

The Tuckerton wireless telegraph station in New Jersey is now, in addition to Sayville (the equipment of which was described in *ELECTRICAL ENGINEERING*, Oct. 29th, p. 563), receiving wireless messages direct from Germany to America. Its interest lies in the fact that the Goldschmidt system is used, and it is from the Goldschmidt station at Eilvese, near Hanover, that messages are being received. The Tuckerton station, of which some particulars are given in the *Electrical World*, had been in experimental operation some months before the war, but on the outbreak of hostilities complications arose on account of the licence for the station being owned by Germans, and the station was taken over by the U.S. Navy Department. On Sept. 15th, however, the main high-frequency alternator broke down, and the station was closed as regards the sending of messages. A new alternator was immediately ordered from Germany to be shipped through Holland, and in the mean time a continuous-wave arc generator was used until an alternator from California had been installed for temporary use. The original equipment was practically a duplicate of that at Eilvese, and included an alternator of about 100-kw. output, with a 3-ft. rotor, with 300 poles driven at 4,000 r.p.m., thus giving a fundamental frequency of 10,000 cycles. By the well-known Goldschmidt "reflection" principle of reinforcing the harmonics by resonance and cascade, superposed frequencies of 20,000 and 30,000 cycles are obtained. The output at this last frequency is about 135 amperes, which, since the antenna resistance is about 6 ohms at 7,400 meters wave length, represents about 110 kw. in the aerial to which the alternator is directly connected through an inductance. The signalling key is connected to the exciter circuit, and thus does not carry the full power. Arrangements are made to weaken the driving motor field when the load comes on, in order to keep the speed constant. The aerial is supported by a lattice steel tower with insulated base 825 ft. in height. The receiving apparatus includes a "tone wheel," or motor-driven high-frequency interrupter, which has the effect of producing a musical note in the telephone with a pitch equal to the difference of the received oscillation frequency and the contact frequency. The receiving arrangement is very simple, and the receiving circuit, inductively coupled to the aerial, contains nothing but the necessary inductances and condensers, the tone wheel, and the telephone, no crystal or other detector, nor source of current being required. At Eilvese, signals from Tuckerton have been recorded photographically by a string galvanometer, even by daylight.

The German named Harold Foohtenberger, *alias* Falconer, who, as mentioned in our last issue, had been handed over to the military authorities for having in his possession a complete wireless telegraph apparatus at his home at Thorpe Bay, appeared before a Court Martial at the Royal Artillery Barracks on Wednesday. The prisoner pleaded guilty, his Counsel stating that neither himself nor the prisoner knew until that day of an addition made on Oct. 16th to the Defence of the Realm Act to the effect that no person may, without the written permission of the Postmaster-General, "buy, sell, or have in his possession under his control, any apparatus for the transmission of messages by wireless telegraphy or any component parts." The evidence was that the prisoner had a wireless telegraph apparatus in his room at Thorpe Bay all ready to be assembled, whilst at Whiteley's there were four cases of wireless telegraph apparatus bearing the prisoner's name. It was stated, however, that the latter had been stored at Whiteley's for more than a year. It was submitted that nothing more than a technical offence had been committed. The prosecution emphasised the fact that the apparatus at Thorpe Bay could have been put together at any moment, and it was not disputed that this apparatus and a flash lamp, which was also found there, would have enabled communication with persons three or four miles at sea. The decision of the Court will be made known in due course.

## ELECTRIC TRACTION NOTES

Dr. H. F. Parshall read a Paper last Tuesday before the Institution of Civil Engineers on "The Economics of Electric Railway Distribution," in which he went into considerable detail on the effect of sub-station proportions and spacing. A number of typical cases were investigated, and it was found that with given energy-consumption per unit of length of line the capacity of the sub-stations increases directly with the distance between them. The energy-loss in distribution conductors of a given section varies with the cube of the distance between sub-stations. The cost of attendance is almost independent of the size of the sub-station. The cost of the plant per kw. falls off with the size of the units, but the maintenance and renewals per kw. are more or less constant. With rotary-converter 600-volt sub-stations, and for certain assumed average conditions, the most economical sub-station spacings are  $8\frac{1}{2}$ ,  $5\frac{1}{2}$ , and  $3\frac{1}{2}$  miles for train services of 6, 12, and 24 trains per hour respectively. For 1,200 volts the sub-station spacings are 11,  $7\frac{1}{2}$ , and 5 miles respectively, while when 2,400 volts is adopted the most economical sub-station spacings are 16, 12, and  $8\frac{1}{2}$  miles respectively. Between 600 and 1,200 there is a saving of 14 per cent. in the total annual costs of the distribution system; as between 1,200 and 2,400 volts there is a further saving of 7 per cent., or 21 per cent. as between 600 and 2,400 volts. If the working voltage is further increased to 3,600 volts, there is a decrease in total annual expenditure on sub-station and overhead conductor equipment of only 3 per cent., which will be less than the additional cost of the rolling stock. For single-phase distribution at 5,000 volts the most economical sub-station spacings are 31, 24, and 16 miles for train services of two, three, and six trains per hour respectively. At 10,000 volts single-phase, the most economical sub-station spacings are 45, 34, and 26 miles for the same three train services respectively. With three-phase distribution at 5,000 volts the most economical distances between sub-stations are 88, 31, and 18 miles for the same respective train services. In most of these last cases, however, the economical distance between substations thus determined is greater than would be permissible in practice from considerations of both traffic operation and voltage drop. Further, in the case of single-phase operation, the lower pressure of 5,000 volts is found to be the most economical for certain services, and the higher pressures of 10,000, 12,000, and 15,000 volts in vogue on the continent are explained by considerations of voltage drop.

The Highways Committee of the L.C.C. contemplates increasing its number of tramcar services, and in order to do so it is necessary to arrange for a supply of electrical energy from an outside source. An arrangement has been come to with the London Electric Supply Corporation for an additional supply up to 1,500 kw. at £3 per kw. per annum plus 0.4d. per unit. The price previously paid for a similar supply was £3 and 0.35d., but the increase is due to the extra cost of coal. The power will be transmitted through the Lewisham sub-station.

At the last meeting of the London County Council, it was decided not to proceed with seven of the proposed tramway linking-up schemes on account of opposition by the local authorities. The reason for this decision was the inadvisability of placing contentious proposals before Parliament at the present time.

In order to work the extensions of the electrically-equipped sections of the Italian State Railways now under construction, thirty-four new 3,000-volt three-phase 16 $\frac{2}{3}$ -cycle locomotives have been ordered by the Government—eighteen of the 4-6-4 type, weighing 84 tons, from Brown Boveri & Cie, and sixteen of the 2-6-2 type, weighing 68 tons, from the Italian Westinghouse Co. Both are driven by side-rods from two motors, jack-shafts at the ends being employed in the former, but not in the latter. The motors develop 1,300 h.p. each at 75 kw. per hour. By a combined arrangement of pole changing and cascade connection four economical speeds are obtained, giving 37 $\frac{1}{2}$ , 50, 75, and 100 kw. per hour respectively.

"Telephone Cables." By J. C. Slippy, of Pittsburg. 147 pp. 7 in. by 4 $\frac{1}{2}$  in. 97 figures. \$2.50. This small volume constitutes a useful epitome of American practice with regard to the specification and lay-out of the cable part of the telephone network, particularly overhead work. THE KILOWATT PUBLISHING CO., LTD., Temple Chambers, London, E.C., holds a small stock of this book, and will be pleased to supply copies at 10s. 6d. net each.

# "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

## Specifications Published Nov. 12th, 1914

A full list of those of electrical interest among these was published in our last issue. The following are abstracts of some of the more important specifications

Names in italics indicate communicators of inventions from abroad.

20,798/13. **Wireless Synchroniser.** M. P. OTTO (Paris). An apparatus for assuring, by means of waves transmitted from a distance, the continuous movement of two rotating bodies so long as synchronism exists. At the receiving station there is a retarding device periodically actuated by the current transmitted when the moving contact passes through the "zero." The retardation by the receiving station is rendered possible only if there is an absence of synchronism at the time that the moving transmitter and the moving receiver pass the zero. The synchronising current thus only acts periodically and during the passage through the zero position. No engagement takes place at the receiving station so long as there is synchronism. (One figure.)

21,212/13. **Wireless Control of Torpedoes.** M. P. OTTO. The system described above is here applied to the steering and control of marine or aerial torpedoes. (Two figures.)

23,342/13. **High-tension Terminals.** F. COATES and A. REYROLLE & Co. These terminals are surrounded by an earthed metal sheath, and interposed between the terminal itself and the outer sheath are alternate layers of conducting and dielectric material, acting as a condenser to render the potential gradient as regular as possible. (Two figures.)

27,660/13. **Protective Systems.** H. W. CLOTHIER and A. REYROLLE & Co. Improvements in protective systems employing split conductors, in which differential devices are used to control switches on the parallel conductors in pairs, one device acting as a relay to the other. (Three figures.)

28,415/13. **Electrical Treatment of Birds and Animals.** T. THORNE BAKER. Apparatus for producing high potentials for the treatment of birds and animals, comprising an induction coil having one of its secondary terminals connected to earth and the other to a spark-gap, the other terminal of which is in turn adjustably connected to a resonator or tuning coil. One end of the tuning coil is connected to a helix surrounding the enclosure in which the subjects to be treated are placed. (One figure.)

2,499/14. **Sparkign Plug.** C. SPADA (Milan). The central insulated electrode can be screwed in to bring it into rubbing contact with the other for cleaning while the engine is running by turning the head of the plug. When the head is released a spring returns the electrode to its proper sparking position. (Four figures.)

3,218/14. **Semi-Indirect Lighting.** E. C. MCKINNIE (National X-Ray Reflector Co.). Indirect lighting fittings in which the lower portion of the reflector is cut away so that a certain amount of light can pass out through a diffuser and illuminate the translucent external bowl. A table lamp on a similar principle is also described. (Two figures.)

## Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Dynamos, Motors and Transformers:** A. G. BROWN, BOVERI ET CIE [Rotary converters] 24,305/13; THOMPSON (Aktiebolaget Ljungströms Angturbin) [Field magnets] 28,967/13; BROOKS and HOLT [Combined engine starter and lighting dynamo] 29,361/13 B.T.-H. Co. and HUTT [Dynamos] 5,234/14.

**Heating and Cooking:** SIMPLEX CONDUITS, LTD., and WATERHOUSE [Radiators] 19,971/13.

**Ignition:** GUINNESS [Sparkign plugs] 24,165/13.

**Incandescent Lamps:** COLD LIGHT (DUSSAUD PROCESSES), LTD., and HALES [Lighting apparatus] 28,025/13.

**Instruments and Meters:** LAWSON [Mercury motor meters] 5,047/14.

**Storage Batteries:** LINGARD [Recharging] 7,717/14.

**Switchgear, Fuses and Fittings:** HOLT and SMITH [Circuit breakers] 24,593/13; BERRY and MARKHAM [Switches] 25,818/13; CRAWFORD [Circuit breakers] 26,006/13; KREIDLER [Lamp-holders] 2,079/14; MCKINNIE [Illuminating devices] 2,529/14; HOLT and SMITH [Circuit breakers] 19,700/14.

**Telephony and Telegraphy:** WESTERN ELECTRIC Co. (Woodward W.E. Co., U.S.A.) [Exchange systems] 24,927/13; BERGLANDER [Automatic selectors] 4,819/14; HEYS (General Acoustic Co.) [Junction boards] 17,356/14.

**Traction:** BOURN [Prevention of clogging of sand pipes] 29,457/13.

**Miscellaneous:** CROSBEE, CROSBEE, and ROGERS [Electric horns] 25,796/13; FAIRBROTHER (Thermo Electric Instrument Co.) [Controlling devices] 1,779/14; DEAN [Electric horns] 5,347/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Meters:** H. ARON-ELECTRIZITÄTSZÄHLERFABRIK GES. [Prepayment] 10,417/14.

**Telephony:** SMITH [Telephone systems] 21,338/14.

The following Amended Specifications can now be obtained:—

R. F. CAREY and R. WAYGOOD & Co. [Vacuum cleaner control] 26,660/12.

AUTOMATIC TELEPHONE MANUFACTURING Co. [Party line telephones] 29,359/12.

## Applications for Suspension of Patents

12,724/10. **Welding.** H. L. J. SIEMUND (New York). An application for suspension of this patent made by J. Roberts will be heard on Nov. 23rd. The specification describes a method of electric welding, repairing or patching, in which an arc is struck between a stick of the material to be added and the work.

12,871/13. **Electric Ignition.** W. RUTHARDT (Stuttgart). In the application by C. A. Vandervell & Co. (see ELECTRICAL ENGINEERING, Oct. 1st, page 529) it has been decided that a licence be granted.

## Opposition to Grant of Patents

Opposition has been entered to a grant on the following application:—

21,029/13. **Metal Filament Lamps.** C. O. BASTIAN. Lamps with wire filaments in helical form, with the convolutions arranged at a distance from one another equal to or less than one-half the diameter of the wire.

## Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

21,216/00. **Graphitising.** P. M. JUSTICE (International Acheson Graphite Co., U.S.A.). A method of graphitising electrodes and other carbon articles by subjecting them to a sufficiently high temperature for a sufficient time, by passing current through them while arranged in rows in contact, with their largest dimensions at right angles to the direction of flow of the current while embedded in a poorly conducting material.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** J. LAFITTE [Arc lamp with revolving reflectors] 15,746/08.

**Electrochemistry:** R. H. F. FINLAY [Anodes for electrolysis] 17,492/07.

**Switchgear:** P. KENNEDY [Switches] 16,962/02.

**Miscellaneous:** G. H. ROWE [Electromagnetic cushioning device] 15,874/08.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**"TUBOLITE."**—A list from the Edison & Swan United Electric Light Co., Ltd. (123 and 125 Queen Victoria Street, E.C.), and Ponders End, Middlesex, deals with lamps, reflectors, &c., for the well-known "Tubolite" system of strip lighting, both with metal filament and carbon lamps.

**STORAGE BATTERIES.**—Another list from the Edison & Swan Co. deals with Ediswan accumulators in all sizes from ignition to central station calls, and including several special patterns for particular purposes.

**CONVEYORS, &c.**—We have received from E. A. Reed & Co., Ltd. (14 Victoria Street, S.W.), a new catalogue dealing with various forms of elevating and conveying machinery, pumps, valves, and other appliances, as well as particulars of general structural steelwork, &c.

**ALUMINIUM.**—The British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), has issued a revised edition of their pamphlet on the employment of aluminium for electric power transmission. The matter has been brought in line with the regulations existing in various countries, and among other additions we find a table of safe currents for overhead aluminium conductors, on a basis of temperature rise, and information regarding line regulation, erection, scrap value, &c. The progress in power transmission by means of aluminium since the last issue of this pamphlet has been remarkable, and one of the most noticeable instances is the Big Creek line, which delivers power at 150,000 volts some 241 miles from its source. Upon this line no less than 2,678 tons of aluminium strand was employed.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**RADIATORS.**—A very attractive little folder with an artistic winter scene reproduced on the cover, and entitled "Kill the Chill," which is being circulated by the British Westinghouse Electric & Manufacturing Co. (Supply Dept., Long Millgate, Manchester), calls attention to the company's lamp radiators and converters by the aid of effective coloured illustrations.

**HEATING APPARATUS.**—An immersion heater, known as "El Boilo," a breakfast griller, a stove, and a toaster, rejoicing in equally euphonious names, together with a hot point electric iron are listed in a folder from Haycock & Haslett (63, Queen Victoria Street, E.C.).

**FIELD REGULATORS.**—A leaflet from the Electrical Apparatus Co., Ltd. (Vauxhall Works, South Lambeth Road) gives prices and particulars of a complete range of field regulating rheostats from 0.15 to 100 amperes, 1.2 to 3,500 ohms.

**POCKET LAMPS.**—A large number of designs of pocket electric lamps, batteries, and electrical and other novelties are listed in a catalogue from Millard Brothers, Ltd. (123 Houndsditch, E.C.).

### THE ELECTRICAL IRONMONGER

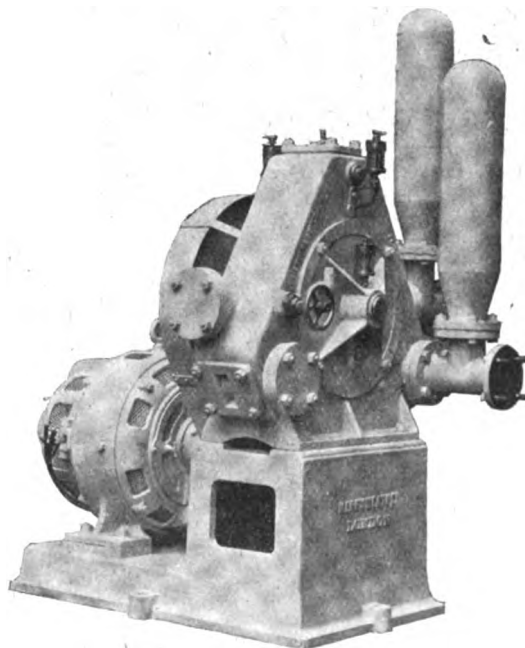
AS mentioned in our last issue, Mr. W. E. Milns, Commercial and Consumers' Engineer of the Birmingham Corporation Electric Supply Department, read a Paper on "The Electrical Ironmonger" before the Birmingham branch of the Ironmongers' Federated Association. After referring to the progress in electric lighting, heating, and power during the last ten years, and welcoming the fact that the unscientific plain opal reflectors and enamelled iron shades were scarce in this country owing to the war, he referred to the relationship between the ironmonger and the electrical trade. The ironmonger, he said, is usually imagined to be master of a large number of trades, and to possess a good knowledge of the various systems of lighting, with the exception of electric lighting. He is also conversant with the many types of coal and gas fires and cooking ranges, and does a large trade in the sale of utensils for the latter, but his knowledge of electric cooking and heating is limited. The time had arrived, Mr. Milns said, for the ironmonger to associate himself more closely with the electrical trade, or rather to satisfy himself whether he was to become an opponent or an ally, instead of remaining practically neutral as hitherto. In his own opinion the ironmonger had not been actually

prejudiced against electrical development, but had simply been unconvinced that electric lighting, heating, and power had reached such a stage as to require his serious notice.

He did not suggest that the ironmonger should design schemes for electric lighting, heating, and power in competition with the wiring contractor unless he was prepared to establish a special electrical department and to keep a qualified staff of wiremen for such work. It was plain, however, that the ironmonger was in close touch with the owner or tenant, and had excellent opportunities for obtaining orders for electric lighting, &c., and he suggested that in most cases these should be sub-let to a wiring contractor, as wiring contractors as a rule bought a considerable amount of ironmongery, and the two trades might mutually assist one another. He warned his audience, however, that they could not be too careful in selecting a contractor of good standing. By this means the ironmonger could deal with all the electrical work in a house, and he saw no reason why he should not also supply fittings and lamps, provided satisfactory arrangements were made with the wiring contractor for wiring and fixing these. A display of electrical fittings in his showroom and the holding of a stock of electric lamps as well as a good supply of electrical catalogues, would be necessary. Only up-to-date fittings should be stocked, and they should not be too crowded, and should be wired so that they could be seen with light on. Electric cookers should be backed up by a substantial maker's guarantee, electric kettles would find a ready sale during autumn and winter, and a profitable business could be done in hiring or hire-purchase of certain makes of heaters. These could be purchased now for a little over a sovereign, carrying with them a three years' guarantee from the makers. They could be let on hire for 2s. per quarter, or on hire-purchase terms for 8s. 6d.

### ELECTRIC FIRE PUMP AT ST. PAUL'S

THE fire protection scheme formerly relied on at St. Paul's included hydrants at the roof levels supplied from rain-water collecting tanks on the stone gallery, but on account of the great weight of these tanks when full, their removal was recently decided upon, and an alternative means for the water supply of these hydrants was required. For



ELECTRICALLY DRIVEN FIRE PUMP.

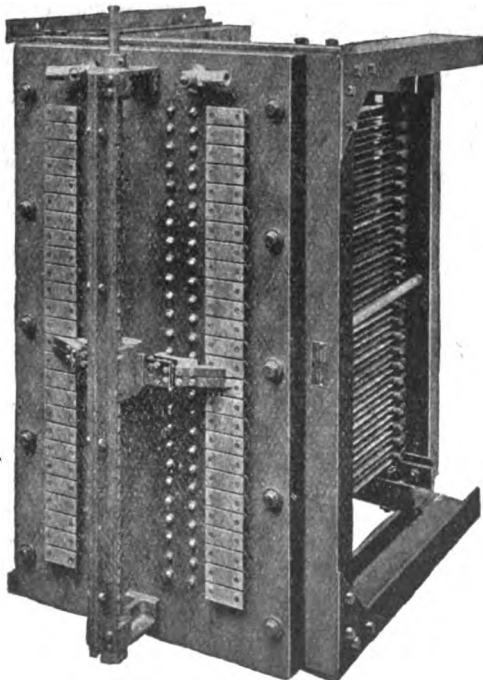
this purpose, Merryweather & Sons (Greenwich) have supplied one of their "Hatfield" pumps, driven by an electric motor, and fixed at the 60 ft. level. The set, which is illustrated here, is very compact, as the pump and motor are mounted on the same bedplate. The power is transmitted from the



motor to the pump through silent chain gearing, and so smooth running is this, and so quietly does the treble-barrel "Hatfield" perform its work, that the installation is practically noiseless when at work. The pump takes its water from the Water Board's supply, and delivers into the ring main round the drum of the dome under the colonnade, hydrants being fitted on this main at various points. Each of the hydrants is equipped with hose and fittings, and a special feature of the installation lies in the fact that the pump starts automatically as soon as one of the hydrants is opened, so that a fire can be immediately attacked at the roof level without its being necessary to go near the pump. When the hydrant is closed the electric current is automatically cut off, and the pump ceases to work.

### LARGE ALTERNATOR FIELD REGULATORS

FOR the regulation of the main exciting current of large generators two forms of regulator are in vogue, the first frequently known as the rectangular type, and the second the face-plate or circular type. The choice between these two patterns is a question largely of local conditions. The General Electric Co. (Witton, Birmingham, and 67 Queen Victoria Street, London, E.C.) construct both patterns, of which they have recently brought out some new designs. The illustration shows the latest form of G.E.C. rectangular type regulator. In this regulator the resistance is composed of resistance strip, though when the characteristics of the generator permit "unit" type wire-resistances are employed. The difficulties incidental to the expansion and contraction of the strip are overcome by the strong construction of



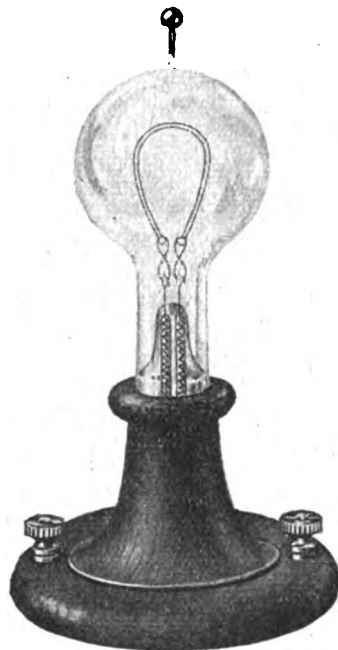
"WITTON" MAIN REGULATOR FOR 5,000-KW. TURBO-ALTERNATOR.

framework. To take the stresses due to this cause, the framework is built up of mild channel steel, braced and supported at every point where the stresses are likely to be particularly heavy. A further source of trouble which has been experienced has been the sag of the strip, and means have to be provided for adjusting the strip tension. In these regulators individual adjustment is provided for each turn of the strip, instead of only one adjustment for the whole length. In view of the heavy current to be carried, special care has been given to the design of the contact brushes which are self-aligning, and two sets of screws are provided by which the pressure and the position of the brushes can be adjusted independently. The illustration shows a regulator for a 5,000-kw. Witton turbo-alternator.

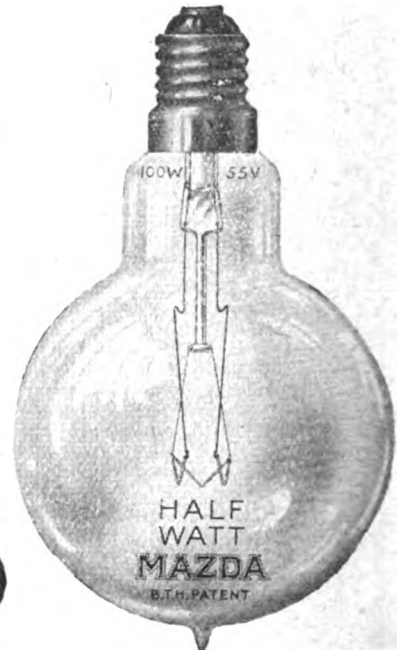
### NEW LAMPS AND OLD

THE two illustrations reproduced here, which have been sent us by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), are striking evidence of the progress attained in the efficiency of incandescent lamps. Edison's original lamp, with its carbonised paper filament, produced after many months of experimenting

35 years ago, gave 16 c.p. for 100 watts, whereas the direct descendant, the "half-watt" lamp of to-day, gives 200 c.p.



ORIGINAL EDISON LAMP,  
16 C.P., 100 WATTS.

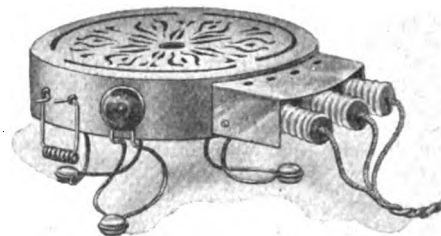


MODERN HALF-WATT LAMP,  
200 C.P., 100 WATTS.

for the same expenditure of energy, and is thus  $12\frac{1}{2}$  times more efficient.

### A NEW ELECTRIC STOVE

ENCOURAGED by the success of their well-known 125-watt "Pygmy" heater, the London Electrical Trading Co., Ltd. (185 Wardour Street, W.), has produced a new pattern of larger capacity, known as the "Pyro-ring," which will do all that the Pygmy heater will do, but do it four times as rapidly. The appliance is illustrated here, and is



"THE PYRO-RING."

6 $\frac{1}{2}$  in. in diameter. The body is of cast aluminium. Three degrees of heat are provided for, and the handles and legs are designed to keep as cool as possible. The loading is 500 watts, and a pint of water can be boiled in about ten minutes. Another larger 2-kw. stove takes the form of a square hob-plate with a well in the centre containing a grid, under which the heating elements are placed.

### NEW PUBLICATIONS

The following new books and new editions have been published since last March.

We shall be pleased to post any of the undermentioned works to any address in the United Kingdom, Colonies, or Abroad at the prices given. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-6 Temple Chambers, Temple Avenue, London, E.C., accompanied by a remittance.

"Laboratory Manual. Direct and Alternating Current." By C. E. Clewell. 100 pp. 9 $\frac{1}{4}$  in. by 6 in. 27 figures. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 4s. 6d. net; abroad, 4s. 10d.

"Electric Car Maintenance," by W. Jackson. 275 pp. 9 $\frac{1}{4}$  in. by 6 $\frac{1}{4}$  in. 320 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.

"Elementary Magnetism and Electricity," by C. M. Jansky. 212 pp. 9 $\frac{1}{4}$  in. by 6 $\frac{1}{4}$  in. 121 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 6s. 3d. net.

"Continuous and Alternating-Current Machinery," by J. H. Morecroft. 466 pp. 7 $\frac{1}{4}$  in. by 5 $\frac{1}{4}$  in. 288 figures.

(New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 7s. 6d. net; abroad, 8s. 1d.

"Telegraphy," by the late Sir W. H. Preece, K.C.B., F.R.S., and Sir J. Sivewright, K.C.M.G. Revised and partly re-written by W. L. Preece. 422 pp. 8½ in. by 5½ in. 269 figures. London: Longmans, Green & Co.) 7s. 6d. net; abroad, 8s. 2d.

"Electric Wiremen's Work," by J. H. Havelock. 332 pp. 7½ in. by 5 in. 100 figures. (London: Crosby, Lockwood & Son.) 5s. net; abroad, 5s. 6d.

"Electric Light Accounts and their Significance," by H. M. Edwards. 172 pp. 7½ in. by 5 in. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 8s. 4d. net.

"Electrical Engineering. A First-Year Course." By F. Shaw. 147 pp. 8½ in. by 5½ in. 80 figures. (London: George Routledge & Sons, Ltd.) 2s. net; by post, 2s. 3d.

"Electrical Practice in Collieries," by D. Burns. 353 pp. 7½ in. by 5½ in. 172 figures. (London: Charles Griffin & Co., Ltd.) 4th edition. 7s. 6d. net; abroad, 8s. 2d.

"High Power Gas Engines," by H. Dubbel. Translated, edited, and expanded by F. Weinreb. 206 pp. 11 in. by 7½ in. 423 figures and 13 plates. (London: Constable & Co., Ltd.) 18s. net; abroad, 19s.

"Electric Traction," by L. Calisch. 116 pp. 8 in. by 5½ in. 36 figures. (London: Locomotive Publishing Co., Ltd.) 2s. net; by post, 2s. 3d.

"Brown's Marine Electrician for Sea-Going Engineers," by A. E. Larkman and A. H. Larkman. 244 pp. 7½ in. by 5 in. 179 figures. (Glasgow: James Brown & Son.) 5s. net; abroad, 5s. 4d.

"Text-Book on Wireless Telegraphy," by R. Stanley. 344 pp. 9 in. by 5½ in. 201 figures. (London: Longmans, Green & Co.) 7s. 6d. net; abroad, 8s. 2d.

"The Electrical Conductivity and Ionisation Constants of Organic Compounds," by H. Scudder. 568 pp. 9½ in. by 6½ in. (London: Constable & Co., Ltd.) 12s. 6d. net; abroad, 13s. 4d.

"The Electron Theory of Matter," by O. W. Richardson. 612 pp. 8½ in. by 5½ in. 58 figures. (Cambridge: The University Press.) 18s. net; abroad, 18s. 9d.

"A School Electricity," by C. J. L. Wagstaff. 250 pp. 9 in. by 5½ in. 181 figures. (Cambridge: The University Press.) 5s. net; abroad, 5s. 5d.

"Electric Light Fitting," by S. C. Batstone. 317 pp. 7½ in. by 5 in. 238 figures. (London: Whittaker & Co.) 5s. net; by post, 5s. 4d.

"Polyphase Currents," by A. Still. 300 pp. 7½ in. by 5 in. 101 figures. (London: Whittaker & Co.) Second edition. 6s. net; abroad, 6s. 5d.

"Electric Cooking, Heating, Cleaning, &c." A Manual of Electricity in the Service of the Home. By "Housewife" (Maud Lancaster). Edited by E. W. Lancaster. 338 pp. 8½ in. by 5½ in. About 320 figures. (Constable & Co., Ltd.) 3s. 6d. net; by post, 3s. 10d.; abroad, 4s. 1d.

"Principles of Electrical Measurements," by A. W. Smith. 243 pp. 7½ in. by 5 in. 99 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 8s. 4d. net.

"Drawing for Electrical Engineers," by G. W. Worrall. 92 pp. 8½ in. by 5½ in. 70 figures. (London: George Routledge & Sons, Ltd.) 2s. net; by post, 2s. 3d.

The "Mechanical World" Pocket Diary and Year-Book for 1915. 439 pp. 6½ in. by 4 in. 81 figures. (Manchester: Emmott & Co., Ltd.) 6d. net; by post, 8½d.

"The Arithmetic of Electrical Measurements," by W. R. P. Hobbs. Revised and edited by A. R. Palmer. 120 pp. 7½ in. by 4½ in. 20 figures. (London: Thomas Murby & Co.) Sixteenth edition. 1s; by post, 1s. 2d.

"Electric Bells, Alarms, and Signalling Systems," by H. G. White. 84 pp. 7 in. by 4½ in. 57 figures. (London: S. Rentell & Co., Ltd.) 1s. 6d. net; by post, 1s. 8d.

"Electric Mine Signalling Installations," by G. W. Lummis Paterson. 196 pp. 7½ in. by 5 in. 139 figures. (London: Constable & Co., Ltd.) 4s. 6d. net; abroad, 4s. 10d.

"Dynamo and Motor Building," by A. H. Avery. 152 pp. 7 in. by 5 in. 145 figures. (London: Cassell & Co., Ltd.) 1s. net; by post, 1s. 1½d.

"A Manual of the High-Speed Steam Engine," by H. K. Pratt. 270 pp. 8½ in. by 5½ in. 182 figures. (London: Constable & Co., Ltd.) 5s. net; abroad, 5s. 6d.

"The Effect of the War on Commercial Engagements," by F. Gore-Browne. 103 pp. 8½ in. by 5½ in. (London: Jordan & Sons, Ltd.) 2s. 6d. net; by post, 2s. 9d.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Atherton.**—Three transformers and 300 yds. of cable are required.

**Barnet.**—The Barnet Guardians require an electric generating plant and electric lift. Architects, Williams and Cox, 34 Henrietta Street, Covent Garden, W.C. Dec. 7th.

**Keighley.**—Sanction has been received to the borrowing of £17,700 for electrical purposes.

**London: Bethnal Green.**—High- and low-tension cable, static transformers, and sub-station switchgear. Consulting Engineer, H. W. Couzens, 50 Queen Anne's Gate, S.W. Dec. 2nd. (See advertisement on another page.)

**Rawtenstall.**—A Local Government Board inquiry has been held concerning a loan of £6,500 for electrical extensions.

**Rhymney.**—The Council is considering entering into an arrangement with the Rhymney Iron Co. for a supply of electrical energy.

### Wiring

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Ayr.**—Kilmarnock Equitable Co-operative Society building (£5,000).

**Blyth.**—New town hall.

**Carlisle.**—Technical school.

**Chelmsford.**—Extensions to isolation hospital (£1,000).

**London: Islington.**—The electric lighting of the Guardians' premises is to be again considered.

**Long Eaton.**—School in Nottingham Road.

**Luton.**—Extensions to isolation hospital (£5,000).

**Manchester.**—Block of offices, Grosvenor Street. Architect, J. B. Thornley.

**Northwich.**—School. Architect, A. E. Powles.

### Miscellaneous

**Australia.**—The time for tendering for various telegraph and measuring instruments has been extended by the Sydney Deputy Postmaster-General until Dec. 9th. Copies of the specifications may be seen at 72 Victoria Street, S.W., or 78 Basinghall Street, E.C., but this information is only of use to firms with resident agents who can be cabled.

**Warrington.**—The Cheshire Lines Committee requires a twelve months' supply of telegraph materials and carbons. Secretary, Battersby Lane.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

The Mirrlees Watson Co., Ltd., has recently received orders for condensing plant from, among others, the Manchester, Devonport, Gravesend, and Leeds Corporations, the Hampstead and Dartford Councils, and the China Light & Power Co.

## APPOINTMENTS AND PERSONAL NOTES

An electrical engineer and tramway manager is required at Erith. Salary from £250 to £400 per annum. Applications to Clerk by the 27th inst.

The salary of Mr. H. C. Busbridge, Borough Electrical Engineer at Swinton and Pendlebury, is to be increased to £200 per annum.

The late Mr. F. Smith, a Director of the London Electric Wire Co. and Smiths, Ltd., left estate valued at £128,279, of which £121,906 is net personalty.

Mr. Alderman John Fettes, the New St. Marylebone Mayor, was at one time Chairman of the Electric Supply Committee.

Particulars of a number of vacancies for shift engineers, &c., are given in our advertisement columns.

## LOCAL NOTES

**Belfast: The Extension Scheme.**—It is not without interest to give briefly the history of the extension scheme concerning which we published a note on p. 582 of our issue for Nov. 5th. We there gave the terms of a resolution postponing the erection of a new power station and authorising extensions at the existing works. This matter was first taken into consideration as far back as June, 1911, when the City Electrical Engineer (Mr. T. W. Bloxam) and Mr. S. L. Pearce, City Electrical Engineer, Manchester, advised the erection of a new three-phase power station to supplement the present three-wire direct-current plant. Both reports particularly advised against replacing the existing D.C. plant as compared with installing A.C. plant on a new site. The matter remained in abeyance until Feb., 1913, when the City Electrical Engineer again reported with additional evidence. Three months later, Mr. Bloxam reported as to the relative cost of a station constructed on six different sites, and showed that the proposed one on the Harbour was the best. Nothing tangible was done, however, until August, 1914, when, as already pointed out, Sir John Snell and Mr. W. J. Pratten reported on similar lines to the previous reports, viz., in favour of a new three-phase station on the Harbour site utilising part of the present station as a rotary-converter sub-station. Notwithstanding this, the Council has now resolved, contrary to all experts, to recommend extensions at the existing works to meet the requirements of the next three years at an estimated cost of £25,000.

**Bristol: Bulk Supply.**—Arrangements have been completed provisionally with the Clevedon, Portishead and District Electric Supply Co. for a supply of electricity in bulk. The consent of the Board of Trade has yet to be obtained, but there should be little difficulty in this. The terms of the contract have been approved by the Council.

**Leeds: The Rateable Value System.**—The Corporation has sanctioned an important modification in the terms of supply for private houses. These consumers will in future have the option of paying on the existing flat-rate basis of 3½d. per unit for lighting and 1d. for cooking and heating purposes, or upon the basis of the rateable value system at the rate of 10 per cent. per annum on the net rateable value of the premises plus ½d. per unit. The object of this new tariff, of course, is to obviate the necessity for two meters and two sets of wires where a consumer desires to use electricity for purposes other than lighting.

**Long Eaton: The Tariff Question.**—The Council has decided not to appeal to the House of Lords against the judgment of Mr. Justice Sargant, confirmed by the Court of Appeal, that the circular offering preferential terms to consumers using electricity exclusively is illegal.

**Willesden: Electric Cooking.**—It has been decided to instal electric cooking apparatus, for which current will be supplied at 1d. per unit, in some of the Council schools for the training of students.

**Wolverhampton: Supply in Bushbury.**—The Corporation has acquired the rights of the Midland Electric Corporation for Power Distribution, Ltd., to supply in the Bushbury district, for a sum of £500.

**Aluminium.**—Some notes on the employment of aluminium for electrical conductors were given by Mr. H. N. Monro at a recent meeting of the Junior Institution of Engineers. Overhead aluminium transmission lines showed a saving over equivalent copper lines of as much as 10-25 per cent., depending on the size and nature of the system. Among the aluminium lines erected in this country were:—three-phase H.T. lines from Aldershot to Enshott, and from Tidworth to Bulford, both for the War Office; lines for Weardale Steel, Iron & Coal Company; Ebbw Vale Steel, Iron & Coal Co.; North Wales Power & Traction Co.; and the Fife Coal Co. For insulated cables aluminium was extensively used, particularly on the Continent, where some hundreds of miles of aluminium mains, principally paper head covered, were laid. For very small cables and heavily armoured cables, aluminium might not show up to the same advantage as for ordinary sized cables, but even in these two classes aluminium cables could effect a saving of 5 per cent. and upwards, depending on the design of the cable. The joining of aluminium cable was a difficult problem in the earlier days. Provided, however, that the joints were carefully made and all moisture excluded, they could be easily and effectively jointed by the very effective mechanical clamps now available. The uses of aluminium for magnet coils, bus-bars, and battery connections were also described.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £55 5s. to £55 10s. (Last week, £52 10s. to £53.)

**Agency.**—Mr. J. H. Baldwin (88 Wallasey Avenue, Belfast) is now acting as Irish representative of Simplex Conduits, Ltd.

**Companies Struck off Register.**—The names of the following will be struck off the register of joint stock companies within three months unless cause is shown to the contrary:—British Wireless Telegraph Syndicate, Ltd.; Electrical Fittings Co. (1911), Ltd.; and the National Electric & Motor Corporation, Ltd.

## NEW COMPANIES

**CITY OF FREETOWN (SIERRA LEONE) ELECTRICITY CO.,** 71A Queen Victoria Street, E.C. Capital £15,000 in £5 shares. The first directors are Hugo Hirst, M. J. Railing, L. Gustav Byng, and A. I. S. Baron.

**SMALL ELECTRIC MOTORS,** Phipp Street, Great Eastern Street, E.C. Capital £10,000. To take over the business of F. W. Potter & Co. at same address.

**"CEAG" MINERS' SUPPLY CO.**—Registered by Jordan & Sons, Chancery Lane, W.C. Capital, £10,000. Dealers in electric and other safety lamps.

**"Things that Happen in Wartime."**—Under this heading, the *Daily Express* has published the following startling announcement:—"Many of the most recently drafted German troops are provided with electric heaters small enough to be carried in the pocket and operated by a dry cell." We are surprised at our contemporary's moderation; why not suggest that the dry cell should at the same time work electric fans and ozonisers for purifying the air in the trenches, electric toasters for rendering the somewhat inferior bread more palatable, electrical excavators for saving the manual work of digging the trenches altogether, and should also be used to charge the barbed wire entanglements at dangerous voltage.

**The Association of Supervising Electricians.**—At a meeting last week a Paper was read by Mr. H. C. E. Jacoby, on A.C. commutator motors. The subject was treated at considerable length, and an interesting discussion followed. The next Paper, on "Wiring Systems," will be read on Tuesday, December 15th, and the inaugural dinner will be held at the London Tavern, Fenchurch Street, on the 28th inst. By the courtesy of the London Electric Railways the members of the Association recently paid a visit to the Paddington-Bakerloo Station to examine the working of the escalators, the whole of the apparatus being thoroughly explained by their inspector, Mr. Lindsay. After leaving the escalators the Company conveyed the members to Edgware Road Station to examine the Ozonair plant.

**The War and Commercial Engagements.**—A useful hand-book on the effect of the war on commercial engagements, including the Acts of Parliament, Rules, and Treasury Orders in connection with the war, by Mr. F. Gore Browne, has just been issued at the price of 2s. 6d. by Jordan & Sons, Ltd. A number of interesting points of law raised by the present situation are discussed, the provision of various Acts which bear on the question, existing before, are summarised, and new proclamations, acts, orders, and regulations promulgated since the opening of hostilities are given in some detail. Among the subjects dealt with are postponement of payments, aliens' restriction, patents, trading with the enemy, contraband of war, &c.

**Electric Vehicles.**—A number of points in connection with electric vehicles were discussed at the recent convention of the Electric Vehicle Association of America, held at Philadelphia. A variety of aspects of the subject were reviewed, and a general impression was gained of closer co-operation between the interests represented in the electric vehicle industry and the increase of charging facilities in America. There was some discussion on the possibility of introducing electric vehicles of very low price, but it did not appear that much progress was being made in that direction. Good experiences were reported in the use of battery traction for fire brigade appliances, in postal service, and for central station purposes, and an interesting technical paper was read by Mr. T. H. Schoeff on regenerative braking, which is not much used in America, bringing forward a system requiring only a few extra contacts on the controller and a separate three-cell exciter battery. Another paper embodied the experiences of a number of industrial firms with electric commercial vehicles.

# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 413 [VOL. X., No. 48]  
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THURSDAY, NOVEMBER 26, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*]

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price **1d.**  
**SUBSCRIPTION RATES.**

United Kingdom. **6s. 6d.** per Annum.

Canada. **8s. 8d.** per Annum.

Other Colonies and Abroad. **13s.** per Annum.

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

### SUMMARY

THE running of inverted rotary converters is dealt with in our Questions and Answers columns (p. 608).

AN interesting letter from our Copenhagen correspondent mentions some of the difficulties which the German electrical industry is now meeting. Copper and aluminium have risen almost to famine prices, the cost of rubber and leather goods has doubled in some cases, but the price of lamps has dropped owing to the curtailment of exports. An analysis of the trade with the Allies which has been lost to Germany is given (p. 609).

THE necessary Parliamentary notice has been given of the L.C.C. power scheme. Notices are also given of the proposal to introduce two Bills by a company. The first one would constitute this the operating company, whilst the second would constitute the company the sole authority, but for a very smaller area than in the L.C.C. Bill (p. 609).

A DIVISIONAL Court has held that debts owing to companies registered in this country but having "enemy" shareholders must be paid. An amendment to the "Trading with the Enemy" Act provides that dividends payable to "enemy" shareholders shall be held in trust by the Public Trustee (p. 609).

THE Intermediate-Grade Paper in Lundbergs' Electric-Light Switching Competition is published. Readers are reminded that the value of the prizes given is larger than in the case of the firm's previous competitions (p. 610).

AMONG the subjects of the Patent Specifications published at the Patent Office last week are radiators, rotary converters, and automatic telephones. The

grant of patents relating to tramway brake adjusters and mine signalling is opposed. The patent for conversion from D.C. to A.C. by the Duddell musical arc has expired after a full life of 14 years (p. 611).

NOTES on a new Marconi station and the dislocation of telegraph traffic due to the war are given under "Telephony and Telegraphy" (p. 612).

ARTICLES on shop lighting, emergency oil-driven ship lighting sets, and electric heating and cooking apparatus appear in our Trade Section (p. 612).

A 500 kw. D.C. turbo-generator is required at Winchester; cable at Middlesbrough; meters at Watford; electrical fittings at West Ham; and new plant at Hammersmith (£10,000) (p. 614).

THE St. Pancras Council has authorised the Western Electric Co. to purchase copper on its behalf in advance (p. 614).

REFERENCE was made to the success of the recent advertising campaign at the Edison & Swan Co.'s meeting (p. 614).

**Arrangements for the Week.**—(To-day) Thursday, Nov. 26th. Institution of Electrical Engineers. "Power Plant Testing," by W. M. Selvey. 8 p.m.—Greenock Electrical Society, 21 West Stewart Street. "The Oscillograph," by J. A. Kinnaird.

Monday, Nov. 30th. Institution of Electrical Engineers, Newcastle Section. "Power Plant Testing," by W. M. Selvey. 7.30 p.m.

Tuesday, Dec. 1st. Institution of Electrical Engineers, Manchester Section, at Engineers' Club. "Power Plant Testing," by W. M. Selvey. 7.30 p.m.—Illuminating Engineering Society at Royal Society of Arts. Discussion on "Illuminating Engineering in War time: some Lessons to be learned from the Present Lighting of London."

Wednesday, Dec. 2nd. Institution of Electrical Engineers, Yorkshire Section, at Philosophical Hall. "Power Plant Testing," by W. M. Selvey. 7 p.m.

**The Electric Vehicle Committee.**—At a recent meeting, the committee reconsidered the question of sizes of cable for charging leads, and decided that it would simplify matters if, for the present, the standard charging plugs were made for one size of cable only, having conductors of 0.1 sq. in. section, the earth wire remaining of the section already recommended. The Committee also had before them some suggestions made by the Engineering Standards Committee, and it was decided to revise the specification further. Arrangements were made in regard to the forthcoming Quarterly Journal, and Mr. A. H. Seabrook was appointed hon. editor. He will take over this duty after the issue of the first number, the preparation of which the hon. secretary had undertaken.

**The Association of Supervising Electricians.**—The inaugural dinner will be held at The London Tavern, Fenchurch Street, on Saturday, at 6.30 p.m. The gathering bids fair to be a large one, as the Association already comprises over 70 members. A number of tickets have been taken by manufacturing firms who are necessarily in close touch with the supervisors, and it is hoped that as many members as possible will attend and bring their friends. The president, Mr. A. H. Dykes, has kindly consented to preside at the dinner and take the chair at the concert which will follow. Tickets may be obtained from the Hon. Sec., Mr. C. J. Banister, 14 Pullborough Road, Southfields.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,418.

A small building for storing explosives at a colliery is fitted with two lightning conductors, one at each end of the building. Each conductor terminates in a copper earth-plate, 2 ft. square, packed in coke, and the resistance between the two conductors through the earth was found to be 17 ohms. Is this a satisfactory value?

Discuss the earthing of lightning conductors, and say whether it would be an advantage to connect the two plates together with a copper bond.—"Tyneside."

(Replies must be received not later than first post Thursday, Dec. 3rd.)

### ANSWERS TO No. 1,416.

Discuss the advisability of running "inverted" rotaries in parallel on both D.C. and A.C. bus-bars, (1) in parallel with each other; (2) in parallel with each other and a separate A.C. supply. The rotaries in question are shunt wound, and are fitted with direct-coupled exciters, and each feeds into the A.C. bus-bars through a separate transformer.—"M. S."

The first award (10s.) is made to "POLYPHASE" for the following reply:—

The conditions essential to the successful inverted running of rotary converters are:—(a) a separate exciter; (b) a magnetically weak armature compared with the field; and, if several rotary converters are to be run in parallel, (c) each rotary converter should feed into separate transformers or separate primary windings on the same transformer. As the first and last of these conditions are fulfilled, and presumably the second is also fulfilled, there is no reason to anticipate that the running of the machines in question should be any other than successful. The following is a brief explanation of the circumstances governing the successful operation of inverted rotary converters:—When operated in the orthodox fashion, the rotary converter has its speed governed by the frequency of the A.C. generators, but when running inverted the converter is, as far as the C.C. side is concerned, an ordinary C.C. motor, and the same characteristics which govern the speed of a C.C. motor also govern the speed of the rotary converter. A weakening of the field will increase the speed, and a strengthening of the field will reduce it. Fluctuations in the supply voltage will therefore vary the speed of the converter, but in addition there are other factors which have the effect of causing irregularities in the speed. The main one is variation in power factor of the load. This power factor is, of course, in practice varying from minute to minute, especially when a large number of induction motors are being stopped and started up. The lagging current weakens the field, while leading currents have the opposite effect. Variations in the power factor will mean proportional variations in strength of the armature reactive ampere turns which affect the field strength, and therefore the speed of the converter. An ordinary shunt wound converter running inverted on a varying inductive load would therefore give considerable trouble owing to variations of speed. Precautions against this have therefore to be taken. The problem is to keep the field strength, and therefore the speed, as constant as possible. The two methods usually adopted in practice are:—first, to supply

the rotary converter from a separate exciter; and, secondly, to make the armature magnetically weak as compared with the field. Usually both precautions are taken, and are fully effective. When rotary converters run in parallel inverted they are liable to the same trouble of cross-currents as discussed in Question No. 1,408, Sept. 24th, 1914. These troubles can be eliminated in the same way as for rotary converters running in the orthodox fashion, viz., by means of balancing coils or by supplying them from separate windings. As has been said, all the conditions mentioned for the successful running of rotary converters inverted and in parallel appear to have been complied with in the case mentioned in the question.

The second award (5s.) is made to "A. R. T. C.," who writes as follows:—

The rotary converter is a machine which can run as well one way as the other, although in practice it is necessary to introduce one or two modifications when running D.C.-A.C. which are not necessary when running A.C.-D.C. Considering case (1), it will be necessary to make use of the exciter on each machine for exciting the main field for the purpose of holding the speed, and therefore the frequency constant. If starting is carried out from the D.C. side, the excitation will be taken from the D.C. bars, and after the rotary is in synchronism the excitation will be transferred to the exciter, suitable paralleling gear being provided. As the whole A.C. supply is taken from the rotaries, the frequency depends on the strength of the fields, assuming constant D.C. volts. If the A.C. load is at unity P.F., then there will be practically no armature reaction, and the speed will remain practically constant with change in load. If, however, a load of P.F. less than unity is connected to the rotary, the wattless current will influence the strength of the field. In the case of an induction motor, where the P.F. is lagging, the wattless current would have a demagnetizing effect, and the rotary would increase in speed. It is the function of the exciter to compensate for this variation. The field is supplied from the exciter, which is run with comparatively weak saturation, so that an increase in speed causes a proportionately greater increase in terminal voltage, thus increasing the excitation of the rotary and keeping the speed almost at normal. It is usual, although not necessary, to have a series winding on the rotary in order to assist the exciter, but as the machines in question are shunt wound it is not necessary to go into the question further. We must now consider the effect of a change in the D.C. voltage. If the voltage increases, the rotary begins to speed up, and at once the exciter automatically increases the excitation of the rotary and keeps the speed within limits. In practically all cases the D.C. voltage will not vary more than 3 or 4 per cent. from the mean, and for this variation the exciter will keep the rotary speed within 1 per cent. There is another point to consider, and that is the voltage drop. For the usual 460-500-volt machines the voltage drop will not exceed 2 to 3 per cent. Whether this is sufficiently close depends on circumstances. Where the D.C. voltage is subject to variation and feeder drops have to be considered, it may be advisable to provide rotaries with A.C. boosters, the fields being connected to the D.C. supply. It is possible, also, to provide the booster with series windings to compensate for the drop, or even to enable a compounding effect to be obtained. Regarding case (2), where the rotaries are to run in parallel with an existing A.C. supply, it would not be necessary to use the exciters, as the A.C. generators would fix the frequency. It would be almost necessary to use rotaries with boosters for ease in paralleling, as well as on account of fluctuations in the load which would occur with every change in the D.C. voltage. To damp down these fluctuations, a series winding could be put on the booster and so connected that, as the D.C. voltage increased, the resultant increase in load would, by means of the series coils, tend to keep the A.C. volts, and therefore the output, fairly constant. Of course, if a constant D.C. voltage is available, series coils on the booster would be unnecessary.

Among other replies, considerable merit is shown in those of "L. R.," "Electron," and "E. P. H."

## ANSWERS TO CORRESPONDENTS

**CONSTANT READER.**—We have replied to your queries by letter.

**POSTULATOR.**—You will find a similar question of open delta or  $\nabla$  connection of transformers, relating, however, to auto-transformers, dealt with in the replies to Question No. 1,322, ELECTRICAL ENGINEERING, Jan. 30th, 1913, p. 63. You will probably be able to apply this to your case without difficulty. We may have an opportunity of giving your first question for competitive replies.

"PHONE" wishes to hear sermons preached in church one mile away. The microphone (not "dictaphone") should be of a type suitable for a large current with a large diaphragm and back plate, but in other respects not necessarily differing from standard designs. Several microphones in parallel should be used, and there should be the ordinary induction coil between the microphones and the line. The larger the surfaces and the greater the number of microphones, the better will be the result in the case in which "Phone" wishes to use a loud speaking

receiver instead of one held close to the ear. There are some loud-speaking receivers on the market, but if "Phone" manufactures his own the chief points to observe are the use of a strong permanent magnet, a sensitive diaphragm well clamped, and a properly fixed gramophone trumpet.

A correspondent wishes to know where crystalline selenium can be obtained, and wishes for particulars of thermo-electric couples using bismuth and antimony or their alloys. Perhaps some of our readers can enlighten him.

### GERMAN INDUSTRIAL DIFFICULTIES

OUR Copenhagen correspondent sends us some interesting particulars on matters connected with the electrical industry in Germany. As it is very difficult to import copper and aluminium the German Government has practically commandeered all the stocks of these two metals which German manufacturers hold. It appears, however, that, if a manufacturer gets an order which requires copper or other similar material, the Government allows him to buy back the necessary metal if it considers that the order should be executed. German firms with whom our correspondent has business relations have written him that they at present pay about £85 per ton for electrolytic copper (the price in England is £58 10s.) and for 98 per cent. aluminium about £140 per ton (as against about £87 here). For rubber and rubber goods the German firms are worse off still, and recent German quotations for goods principally made of rubber or ebonite are from 50 to 100 per cent. higher than usual. In leather there is also a scarcity, and leather goods have risen over 100 per cent.

Notwithstanding all this the Germans still export a large quantity of electrical goods, and it is surprising that prices on the whole are not greatly increased. Metal filament lamps are, in fact, being sold in large quantities at prices that are lower than they have ever been before, and our correspondent does not believe that the prices of these will go up just at present. This is no doubt partly because a very large proportion of Germany's electric lamp manufacture has always been hitherto for export, and partly because electric lamps are made by girl labour, so that the output of the factories can very well be in excess of the demand. Lampholders, switches, and other articles in the construction of which copper and brass enters largely have so far only risen from 10 to 15 per cent.

Our correspondent adds that practically all his business connections in Germany continue to send him printed matter in large quantities containing "fairly tales or rather goblin tales" about the crimes England is committing, has committed, and will commit.

It is of interest to note that the *Elektrotechnische Zeitschrift*, the leading German electrical newspaper, only now appears at irregular intervals, about every second week instead of weekly. We have heard nothing of the other two electrical papers, *Kraftbetriebe & Pannen* and the *Elektrotechnischer Anzeiger*, and it is not improbable that these have suspended publication altogether. It is of interest to contrast the position with that in England, where there are six weekly electrical newspapers, all of which are being published as usual.

An article which appeared in the *Elektrotechnische Zeitschrift* of Aug. 27th gives some interesting information as to Germany's previous export trade in electrical machinery and apparatus, supplementing that which we were able to publish in our own journal on Aug. 13th. The latest revised figure for the total of Germany's electrical exports for 1913 is £16,500,000, of which 34½ per cent. was to countries now at war with Germany. This 34½ per cent. was divided among the various countries as follows: Great Britain, 10½ per cent.; Russia, 12 per cent.; Belgium, 6½ per cent.; and France, 5½ per cent.

To England the chief exports were: Dynamos, Motors, Transformers, &c., £243,000; Accumulators, Batteries, &c., £9,000;

Cable, £53,000; Arc Lamps and Projectors, £27,000; Incandescent Lamps, £223,000; Telegraphic and Telephonic Material, £93,500; Instruments and Meters, £73,000; Insulated Wire, £308,000; Carbons, £100,000; Unclassified, £487,000.

To Russia.—Dynamos, Motors, &c., £426,000; Accumulators, Batteries, &c., £4,000; Cable, £31,000; Arc Lamps, &c., £63,000; Incandescent Lamps, £440,000; Telegraphic and Telephonic Material, £104,000; Instruments and Meters, £232,000; Insulated Wire, £44,000; Carbons, £33,000; Unclassified, £486,000.

To Belgium.—Dynamos, Motors, &c., £224,000; Accumulators, Batteries, &c., £10,000; Cable, £212,500; Arc Lamps, &c., £9,000; Incandescent Lamps, £119,000; Telegraphic and Telephonic Material, £55,500; Instruments and Meters, £51,000; Insulated Wire, £86,000; Carbons, £46,000; Unclassified, £233,000.

To France.—Dynamos, Motors, &c., £149,000; Accumulators, Batteries, &c., £3,000; Cable, £10,000; Arc Lamps, &c., £10,000; Incandescent Lamps, £131,000; Telegraphic and Telephonic Material, £36,000; Instruments and Meters, £60,000; Insulated Wire, £15,000; Carbons, £47,000; Unclassified, £380,000.

This trade is now absolutely lost to Germany, and if British firms display sufficient energy, practically the whole of it should be acquired by the conclusion of the war.

### THE FUTURE OF LONDON'S ELECTRICITY SUPPLY

THE necessary Parliamentary notices have been given with regard to the London County Council's power scheme, a general outline of which has been already given in our columns. The proposed Bill sets up the electricity authority for London and adjoining districts, gives power to transfer the various undertakings to the operating company, establishes the Technical Committee, and generally gives the Council all the powers which have been referred to in the special report by Messrs. Merz & McLellan and in a report by the Special Committee of the Council which has been dealing with the matter. It is also proposed to buy land in Barking and Erith for the purposes of generating stations.

In addition, notice is also given of a Bill relating to the incorporation of the proposed operating company. It empowers this company to negotiate for and carry into effect agreements with the London County Council or any public authority authorised to supply electricity in or near London and to act as agents for the London County Council or any such authority.

Apparently with a view to providing an alternative, in the event of the L.C.C. Bill not being passed in its present form, a second Bill, by the same promoters, relates to the incorporation of a company with powers to supply electrical energy for all purposes in an area comprising the County of London and portion of the counties of Middlesex, Hertfordshire, Buckinghamshire, Berkshire, Surrey, Essex, and Kent. This area is considerably smaller than that proposed in the L.C.C. scheme, and leaves out all the important extra metropolitan supply authorities. It includes for the most part the bulk supply area already granted to the Metropolitan Electric Supply Co. in the west of London and a number of districts outside London in which the County of London Co. has power to supply. The Bill will also take powers to transfer to the new company the undertakings of all the London electric supply companies either by agreement or by arbitration.

With regard to the London County Council scheme, the Law and Parliamentary Committee of the Hammersmith Borough Council recommends that authority to urge local authorities and companies supplying electricity in the area proposed to be dealt with in the Bill, to make strong representations to the London County Council to postpone it, at any rate for the 1915 session.

Mr. H. H. Gordon has resigned from the Special Committee on London's Electricity Supply, which has been dealing with the matter on behalf of the L.C.C. This action is not altogether unexpected after Mr. Gordon's uncompromising speech during the debate on the scheme (*ELECTRICAL ENGINEERING*, Nov. 12th, p. 587.)

**London Electrical Engineers (T.F.).**—The Corps of London Electrical Engineers (Territorial Force) is again open to recruiting. Electrical engineers, central station engineers, and engine drivers are specially required. Forms of particulars can be obtained from the Officer Commanding at 46 Regency Street, Westminster, S.W.

## TRADING WITH THE ENEMY

THE position with regard to trading with the enemy has been made somewhat clearer during the week, partly through a judgment of a Divisional Court and partly by an amendment to the Trading with the Enemy Act, 1914. We referred to the general position under the Proclamation issued early in September, in *ELECTRICAL ENGINEERING*, Sept. 17th, p. 502. Limited companies registered in this country are not considered to have "enemy character," even if the shares are held by alien enemies, but the Board of Trade may appoint the Public Trustee to act as custodian in the case of all companies holding money which, but for the conditions of war, would have been payable to shareholders in enemy countries. The Bill also provides that the assignment of debts by enemies is invalid, and any person knowingly paying such a debt will be guilty of the offence of "trading with the enemy." It is also provided that sums due on coupons, suspected of being enemy property, shall be paid into court, and fresh conditions are laid down as to the incorporation of new companies.

The payment of dividends of German shareholders to a trustee appointed by the Government was, as a matter of fact, actually suggested by Mr. Hugo Hirst in the case of the Osram Lamp Works, Ltd., and the suggestion was, we believe, adopted by the Government soon after the commencement of the war.

Another aspect of the "trading with the enemy" question is as to the payment of debts incurred before the war to companies registered in this country, but having a large proportion of their shares held by enemies. This point was brought into prominence in the recent action by the Armorduct Manufacturing Co., Ltd., against Messrs. Defries & Co. (*ELECTRICAL ENGINEERING*, Oct. 22nd, p. 555), when Judge Atherley Jones, in the City of London Court, held that as the shares of the Armorduct Co. were held mainly in Germany, the payment of a debt of 30s. by Messrs. Defries & Co. would constitute "trading with the enemy." A Divisional Court, consisting of Mr. Justice Horridge and Mr. Justice Rowlatt, on Thursday, however, held that this view is wrong, and that a company registered under the Companies Acts in this country, no matter the nationality of its shareholders, is a British company, and could carry on business in this country as if a state of war did not exist. It was argued for Messrs. Defries that a company merely represented its shareholders, that in this case the profits from such debts would go to the enemy, and consequently this would be "trading with the enemy." Messrs. Defries, of course, contested the case as one of principle, and counsel for the Armorduct Co., remarking that the result would inure to their benefit, said it was not proposed to ask for costs.

It was announced in the House of Commons on Monday that an inspector was appointed some time ago under the "Trading with the Enemy" Act in the case of Siemens Brothers & Co. and Siemens Brothers Dynamo Works, Ltd.

## LUNDBERGS' ELECTRIC-LIGHT SWITCHING COMPETITION

(For Initial Announcement, and Particulars of Prizes, etc., see "Electrical Engineering" of Nov. 12th, p. 587.)

### RULES TO BE OBSERVED IN WORKING PAPERS.

1. Three Papers are set: Preliminary, Intermediate and Advanced. Any one of the three papers may be taken, but not more than one. The Preliminary Paper was published in "Electrical Engineering" of Nov. 19th, the Intermediate Paper is given below; and the Advanced Paper will be published on Dec. 3rd.

2. Competitors who have passed the Preliminary Grade on a previous occasion must take either the Intermediate or Advanced Grade. Those who have passed the Intermediate Grade must take the Advanced Grade. Those who have passed the Advanced Grade cannot enter.

3. When figure or page numbers are mentioned in the questions, they refer to the booklet "Lektrik Lighting Connections" (new 3rd Edition \*); by the help of which the paper may be worked.

4. Each answer must be done on a separate sheet (or sheets) of paper, on one side only; and each sheet must bear the writer's full name and address. It is not necessary to paste the questions on the answer paper.

5. Each answer must be numbered to correspond with the question.

6. Any competitor who does not wish his own name to appear in the published results should give a *nom-de-plume* or fancy name for this purpose. In all such cases, however, Rule 4 must be adhered to. In the published results only the names (or *noms-de-plume*) and the towns (not full addresses) of successful candidates will be published.

7. Answers to Papers must be addressed to the Editor of "Electrical Engineering," 203, Temple Chambers, London, E.C. Those

\* For the convenience of our readers we have arranged to keep a stock of this Booklet, and a copy will be sent by return of post on receipt of seven penny stamps. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203, Temple Chambers, London, E.C.

from competitors living in or near the United Kingdom must reach the Offices of "Electrical Engineering" on or before Jan. 11th next, and the results will be published in "Electrical Engineering" of Feb. 25th, 1915. Answer Papers from far-off competitors must reach the Offices of "Electrical Engineering" by June 1st, 1915, and the results will be announced later.

8. The answer papers sent in will not be returned.

### INTERMEDIATE-GRADE PAPER.

As many as possible of the following ten questions should be answered.

1. Explain briefly the differences between the controls in Circuits 36, 81, and 87, and the reasons for same.

2. The hall and staircase lights in a doctor's house have been wired to a two-way-intermediate control. It is desired afterwards to substitute something for one of the end two-way switches which will act in this capacity and at the same time allow an additional light (in the porch) to be plug-connected to it, this light to be unaffected by the switches. What apparatus would you use, and what additional wiring would be necessary?

3. The auditorium of a small picture theatre is lighted by groups of mixed white and red lamps. The red lights are used only while the pictures are running, and the white lights during the intervals. At one switch-point the current can be put on to either the red or white lamps, or it can be turned off. At two other switch-points the light, if already on, can be changed from white to red, or from red to white. Sketch the connections. ("Marvel" switches must not be used, as their current capacity is not great enough).

4. How could the head lamps on an automobile be arranged to give a dim light when passing through towns or when standing still? Sketch two possible arrangements of lamps and switches without introducing any other portions of the car wiring, and say what the advantages of each are.

5. Compare the two methods (Circuits 61 and 62) of connecting to series-parallel-and-off switches, and state what advantages or disadvantages (if any) each possesses.

6. A fairly-large sitting-room with two doors is fitted with Circuit No. 52. The switches are placed at the doors, and by one of these the + and - leads rise through the floor. X consists of six lights, 3 on a counterweight pendant, and three on single-light wall brackets. Y consists of eight picture lights. Make a plan of the room, and show thereon the positions of the lamps, and the run of the wires.

7. In wiring-up two "Marvel" switches for Circuit 41, a wireman, instead of following the regulation method of connecting the strapping wires, connects them 1 to 2, 2 to 3, and 3 to 1. What difference (if any) will this make in the control?

8. Select master controls (one in each case) suitable for: (a) a small shop, (b) an office, (c) a house, (d) some other situation. Show where the various switches would be placed, and explain how the controls would be used.

9. Show that the electric-wire-and-switch system (with modern controls) is as great an advance upon the gas-pipe-and-tap system, as the latter was upon oil-lamps and candles.

10. Criticise the construction of the "Pivot" single-way and two-way, and the "Duplex" two-way-off tumbler switches. Enumerate such good points therein as you can discover for yourself.

N.B.—Samples of any of the switches, &c., referred to can be supplied to competitors at the average rate of 2s. 6d. each. Requests for samples must be accompanied by remittances, and must be sent direct to A. P. Lundberg and Sons, Switch Specialists, 477-489 Liverpool Road, London, N. The money will be returned when the samples are sent back in good condition. Mention Competition when ordering. The above is an outside price as regards most switches, and a considerable reduction can generally be made when competitors desire to retain the switches.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published Nov. 19th, 1914

A full list of electrical patents published last week appeared in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

19,971/13. **Radiators.** SIMPLEX CONDUITS, LTD., and L. N. WATERHOUSE. A design of radiator comprising a conical or parabolic reflector mounted on a universal joint and one or more heating elements in the form of a rod along the axis of the reflector. (Seven figures.) This radiator was described in ELECTRICAL ENGINEERING, Oct. 22nd, p. 554.

24,305/13. **Rotary Converters.** A. G. BROWN, BOVERI ET CIE. Rotary converters with interpolar commutating windings on cores have a permeability about equal to unity even at low loads. (One figure.)

25,818/13. **Switches.** W. H. BERRY and W. J. MARKHAM. An improved design of enclosed push-in switch fuse in which the fuse-carrier forming the movable contact bridge is mounted on a parallel motion consisting of two toggle joints to the elbows of which springs are attached giving the desired quick break action. (Two figures.)

28,025/13. **Projector Lamp.** COLD LIGHT (DUSSAUD PROCESSES), LTD. and G. E. HALES. Details of construction of a projector lamp in which a number of incandescent lamps, mounted on a rotary carrier, are lighted momentarily in succession as they pass across the axis of the optical system. (Two figures.) (See ELECTRICAL ENGINEERING, Vol. IX., p. 262, May 8th, 1913.)

29,361/13. **Engine Starter and Car-lighting Dynamo.** B. BROOKS and W. HOLT. This machine has two armature windings connected to the same commutator, each suitable for a different number of effective poles. An additional brush is put into circuit when the maximum number of poles is energised for running at slow speed for engine starting. (Five figures.)

4,819/14. **Automatic Telephones.** C. A. BETULANDER. A telephone system in which the different circuits are selected by means of combining relays, and a selective device controlling their circuits provided with two or more series of selective relays adapted to receive or mark the selective current impulses corresponding to the various digits. (Two figures.) See ELECTRICAL ENGINEERING, July 9th, p. 399.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Dynamos, Motors, and Transformers:** A. G. BROWN BOVERI ET CIE. [Rotary converters] 24,337/13; LUCAS AND TURNER [Engine starter] 1,227/14; HADDAN [Motors for D.C. and A.C.] 4,249/14.

**Electrometallurgy and Electrochemistry:** ROSSI [Electrodes for nitric oxide preparation] 23,959/13; MACHALSKI [Electric furnaces] 15,455/13.

**Heating and Cooking:** DOWNE and BROMITON & KENSINGTON ACCESSORIES CO. [Cooking apparatus] 23,218/13; NEWITT & FLETCHER [Soldering irons] 25,621/13.

**Incandescent Lamps:** BASTIAN [Filaments] 22,331/13.

**Switchgear, Fuses, and Fittings:** HOPE [Switches] 24,198/13; ROOTHAN and FERRANTI, LTD. [Quick break switches] 24,672/13; POWELL [Earthing and binding clip] 25,335/13; BROADBENT [Conduit fittings] 25,544/13; BONNELLA and BONNELLA [Switches] 27,870/13; URQUIHART [Fuses] 10,514/14.

**Telephony and Telegraphy:** SAVIN [Telephone systems] 25,283/13; DENBIGH [Telephone meter] 25,437/13; EASTERN TELEGRAPH CO., FRASER and WOOD [Telegraph receivers] 28,952/13; PRATT & ORLINGS TELEGRAPH INSTRUMENTS SYNDICATE, LTD. [Signalling] 29,691/13; BETULANDER [Automatic and semi-automatic telephone systems] 6,210/14; GRAHAM [Telephone systems] 7,331/14.

**Traction:** MCKENZIE & HOLLAND, LTD., and EDMONDS [Signalling] 25,006/13; WILKINSON [Electric drive of motor-cars, boats, &c.] 27,611/13; WILLS and SYKES [Insulated rail joints] 7,884/14.

**Miscellaneous:** NEWITT & FLETCHER [Electric soldering irons] 25,621/13; MANDER [Pocket lamps] 7,079/14; HITZELSBERGER and NEW BRITISH EVER READY CO. [Pocket lamps] 17,025/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Incandescent Lamps:** BUENO Y TORRENS, 14,789/14.

**Switchgear:** MILLER [Switches] 21,593/14.

**Miscellaneous:** DOUGLAS and ANR. [Electric staff exchanges] 19,441/14; MARELLI [Electric machines] 20,782/14.

The following Amended Specification can now be obtained:—

**Telephony:** SIEMENS BROTHERS & CO., LTD. [Automatic system] 2,409/13 (see below).

### Applications for Amendment

22,408/09. **Tramcar Trucks.** J. E. ANGER (United Electric Car Co., Preston). Application has been made to amend this specification by limitation of claims. It describes improvements in the suspension of tramcar trucks.

### Amendments Allowed

2,409/13. **Automatic Telephones.** SIEMENS BROTHERS & CO., LTD. (*Siemens & Halske A.-G.*). Leave has been granted to amend this specification by way of disclaimer. The specification is of great length, with 25 claims and 38 figures, and describes a selective method of connection of subscribers' lines in an automatic or semi-automatic telephone installation.

13,006/13. **Ignition Devices.** UNTERBERG & HELMLE (Baden). Leave has been granted to amend this specification, which is for magnetos with perforated extensions to the pole-pieces to secure a broad peak to the E.M.F. wave.

### Opposition to Grant of Patents

19,842/13. **Brake Adjusters.** E. PECKHAM and S. THOMAS. Opposition has been entered to a grant on this specification, which is for automatic adjusting devices on tramcar brakes.

8,975/14. **Mine Signalling.** J. A. ADLINGTON. The grant of this patent, which is for an electrically actuated step-by-step mine signal indicator, has been allowed in spite of opposition.

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

2,165/00. **Telegraph Poles.** E. H. CHAMBERS. Joints for tubular metal telegraph or other poles in which a seating is made inside a tube for the reception of one of smaller diameter by cutting off a wedge-shaped piece of the latter and fixing it inside the larger tube.

21,629/00. **Current Conversion.** W. du B. DUDELL. Converting continuous into alternating current of controllable frequency by means of the well-known "musical arc" or other similar device in a resonating circuit.

21,642/00. **Fuses.** J. C. A. WARD. A porcelain handle clip bridge fuse.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** G. E. HARRISON and J. G. BURNS [Insulating guard for linesmen] 16,136/08; P. T. KENNY [Combined picture moulding and conduit] 17,999/09.

**Electrochemistry and Electrometallurgy:** C. C. WALKER [Plating small articles] 17,384/06; S. JEVONS and V. D. GREEN [Welding] 18,036/09; M. SAUVAGEON [Electric furnace] 18,118/09.

**Incandescent Lamps:** A. C. HYDE [Mounting of filaments] 17,817/07.

**Storage Batteries:** R. M. LLOYD [Battery for launches and submarines] 15,818/01.

**Switchgear, Fuses and Fittings:** H. HUBBEL [Chain-pull switch lamp-holder] 15,801/01.

**Traction:** B. G. LAMME [Regenerative control of single-phase motors] 5,508A/07; C. B. HOLMES and A. DALLEN [Trolley leads] 14,480/08.

**Miscellaneous:** E. TYER and F. T. HOLLINS [Multiple relays] 17,000/04; W. TAYLOR [Magnetic tester of temper of steel] 15,809/05.



## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

Chili has prohibited telegrams in code or cipher.—The South American Cable Co. states that their deferred service is resumed.—The Spanish Administration has applied Article 8 of the Convention.—On the 12th inst. normal conditions again prevailed in the interior of Haiti.—Communication with Dombé Grande Quilengues Angola is restored.—The Bulgarian Administration states that, owing to great pressure of traffic, they are unable to take responsibility for delays for or *via* Bulgaria.—Servia has also now applied Article 8 of the Telegraph Convention. Private telegrams are submitted to censorship and sender's risk.—Traffic *via* Zante is subject to delay owing to pressure of business, and the office at Rome will not take any responsibility for delay on telegrams to Italy and beyond.—According to the ruling of the German Military Authorities, Luxemburg notifies that telegrams to that State must be written in plain German, and are subject to censorship.—Turkey prohibits telegrams from hostile States either

destined for or in transit *via* that country.—The Province of Angola has applied Article 8 of the Telegraph Convention. No applications for refunds will be entertained. Only telegrams written in plain Portuguese, French, or English, with sender's signature, will be admitted, and they are subject to censorship and sender's risk.

The Marconi stations in New Jersey which have been built to communicate with the stations recently opened at Carnarvon are now completed, and some notes thereon appear in the *Wireless World*. As at Carnarvon the transmitting and receiving stations are some distance apart, the former at New Brunswick and the latter at Belmar, overlooking the Shark river. The station building at the latter is at the foot of the hill by the river, and the aerial stretches away up-hill to the west for about a mile, supported by eight masts each 300 ft. high. The wires are kept taut by steel cables and counterweights. The situation being on rather marshy ground near a river, an exceptionally good earth can be obtained by burying a network of copper wires and zinc earth plates. These plates are placed in a circle with a radius of 100 ft. The site of the New Brunswick station is at the correct distance and bearing for duplex working, and adjoins both a canal and a stream, and a somewhat similar but more elaborate earth connection is employed.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### SHOP LIGHTING

WE have before us an attractive illustrated booklet on shop lighting, which the British Thomson-Houston



FIG. 1.—SUITABLE AND UNSUITABLE LIGHTING.

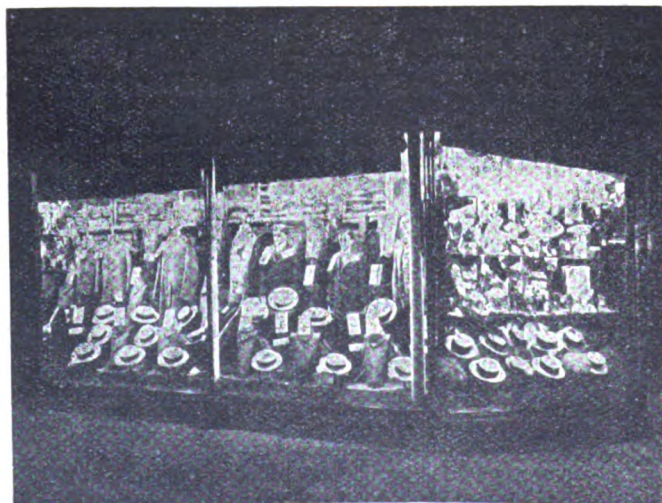


FIG. 2.—A BRILLIANT SHOP WINDOW.

Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), has just produced, in which the requirements of adequacy,

distribution, diffusion, and economy, so important for shop lighting, are discussed, and a number of installations designed by the company are illustrated, employing Mazda lamps in the firm's special reflectors. These illustrations, of which we reproduce a few, range over almost every class of business, and in crude examples, both of direct and indirect lighting. One very effective illustration, reproduced in Fig. 1, shows a tobacconist's window, half of which is lighted in the



FIG. 3.—A NEW METHOD OF INTERIOR LIGHTING.

ordinary way by unshaded lamps and the other half by lamps in suitable reflectors. Fig. 2 is another good example of shop window illustration, where practically all the light is concentrated on the goods to be displayed; and Fig. 3 shows the interior of a chemist's shop, lit in a new way by lamps with suitable reflectors behind opal glass panels round the upper part of the wall. The booklet is very well produced, and has a very artistic cover design executed in Wedgwood blue.

An "Equiluxo" Ash Tray.—The General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), have sent us a handsome ash tray moulded in their well-known "Equiluxo" glass to a design possessing distinct artistic merit. This glass is now used extensively in the form of bowls and spheres for lighting the better-class showrooms of large drapery establishments, stores, &c. The company inform us that this glassware has been installed throughout Messrs. Robinson and Cleaver's new premises, the ground floor of Messrs. Harrods, and the "Saxone" Shoe Company's branches among other places. The General Electric Co. will be pleased to present one of these ash trays to any interested inquirer about "Equiluxo" glassware.



## CATALOGUES, PAMPHLETS, &c., RECEIVED

**GLASSWARE.**—A new and complete list of their well-known scientifically designed prismatic glass shades and reflectors has been issued by Holophane, Ltd. (12 Carteret Street). All the latest forms are included, and among them special attention may be called to the patterns designed for use with half-watt lamps.

**CASING, STRIP LIGHTING, &c.**—A collection of leaflets from the Linolite Co. (25 Victoria Street, S.W.) give particulars of the latest forms of their well-known "Tubolite" system of strip lighting, of their "Woodhouse" steel casing, and certain other non-electrical products. It is pleasant to be able to announce that the whole of these articles are British made, and that the prices of the tubolite lamps and fittings show a slight reduction.

**ADJUSTABLE FITTINGS.**—A card from Dugdill's Patents (Failsworth, Manchester) illustrates a large number of designs of this firm's well-known convenient and moderate-priced adjustable fittings with self-sustaining joints.

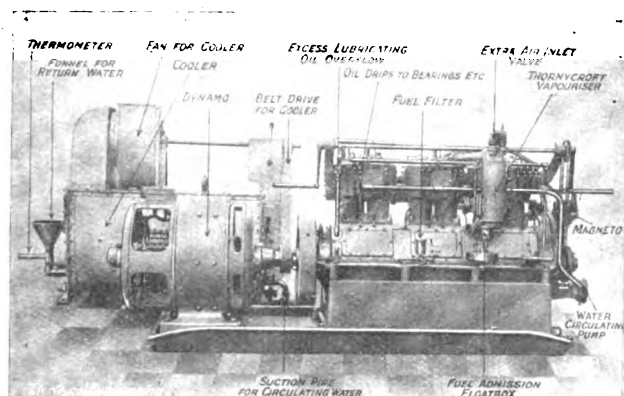
*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**RADIATORS.**—A list from J. & W. B. Smith (15 to 23 Farringdon Road) illustrates a large number of designs of radiators of British manufacture, both of the lamp and "hot-bar" types.

**HEATING AND COOKING APPARATUS.**—The Dowsing Radiant Heat Co., Ltd., have issued a new complete list of electric heating and cooking apparatus, as well as a convenient abridged list. Several new patterns of radiator are included, fitted with the patent Dowsing-Huntley hot-bar element. These are provided with a back reflector, so that the heat is all thrown forward into the room with no loss by radiating heat to the walls. The cooking ranges are also fitted with this element, and it is interesting to note that many of these bars have now been working as long as 4,000 hours without showing signs of deterioration. Other articles listed are soldering irons and domestic and laundry irons, &c., formerly made by Eastman & Warne, whose business was recently purchased by the Dowsing Co.

## EMERGENCY MARINE LIGHTING SETS

IN view of the fact that the Convention on "Safety of Life at Sea" recognises emergency lighting sets as essential on all passenger liners, John I. Thornycroft & Co. have developed a special series of oil-driven sets of the type illustrated here. Examples of these have recently been installed on the Canadian Pacific boats *Missanabic* and *Metagama*. The sets consist of plain shunt-wound protected type two-bearing continuous-current 40-kw. 110-volt dynamos, direct-driven by six-cylinder Thornycroft 70-h.p. paraffin engines. The vaporiser is arranged that its temperature can easily be varied to suit different grades of fuel, while the engine may be started immediately on petrol and changed over to paraffin within five to ten minutes, or started on



EMERGENCY OIL DRIVEN SHIP LIGHTING SETS.

paraffin by a lamp. Half-compression cams are fitted to facilitate starting, and the cooling water is circulated through a special type of cooler by a rotary gear pump. This closed-circuit cooling arrangement is adopted in preference to taking the suction direct from the sea, on account of such sets frequently being placed on large ships as much as 80 ft. above sea-level. The cooler consists of a revolving drum dipping in

water and with a current of air driven over its surface by a fan. The loss of water per hour is about 1·6 gallon. These sets are usually installed in a steel compartment on the boat deck with the switchboard controlling their circuit, and are entirely self-contained. They are compact, silent, economical, light, and easily handled, and are of the most robust construction. Similar sets are manufactured in various sizes ranging from  $3\frac{1}{2}$  to 100 kw.

## ELECTRIC HEATING APPARATUS

THE numerous items of electric cooking and heating which have been brought out lately by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), and represent the manufacturing output of no small part of their Ilceue Works, Birmingham, are now brought together in an attractive new catalogue. Our readers are already familiar with many of these, such as the "Magnet" fires (ELECTRICAL ENGINEERING, Nov. 5th, p. 580), but there are some general features and particular novelties that we should like to refer to. In addition to the "Magnet" fire, the Company make another heater of the "rod" type (see ELECTRICAL ENGINEERING, May 14th, p. 232), where the heat is a little more

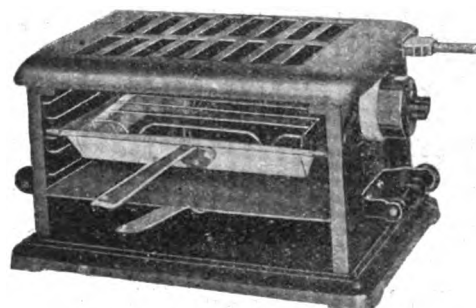


FIG. 1.—LATEST PATTERN GRILL.

concentrated into a comparatively small number of separately replaceable glowing bars formed of wire-wound rods of refractory material. Both these and the more familiar lamp radiators are made up in styles from the simplest to the most ornate, and non-glowing heaters or convectors in many forms are also listed. The great feature of the cooking appliances, and, indeed, also of such items as the flat irons and soldering irons, is the use in all cases of easily interchangeable heating elements, although happily the occasions for replacing them are becoming rarer and rarer. The whole series, ranging from kettles to complete domestic cookers, is too extensive to particularise, but we may mention that householders of every class of pocket are appealed to. One of the very latest grillers with two heats (750 watts each) is illustrated in Fig. 1. Attachments are made to fit over these



FIG. 2.—UNIVERSAL TRAVELLING OUTFIT.

to form complete portable ovens, and a very suitable set for small flats where space is limited results. Several grades at different prices are made. Another novelty illustrated in Fig. 2 is a travelling universal voltage set, in which an iron with both high- and low-tension windings has suitable accessories to convert it into a hot-plate, water-boiler, or curling-iron heater. Among other articles listed are sterilisers, self-contained saucepans and frying-pans, urns, toasters, cooking plates and warming plates, such industrial appliances as glue-pots, sealing-wax heaters, and soldering irons, and such miscellaneous apparatus as curling-iron heaters, cigar lighters, and electrically-heated hat-pads, carpets, and foot warmers.

**New Members of B.E.A.M.A.**—The following firms have recently been elected "Members" of the Association:—Ashworth & Parker, Greenwood & Batley, Ltd., Sandycroft, Ltd. The Harland Engineering Co. has been elected an "Associate."

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Blackrock.**—A loan is to be applied for in connection with the new electric lighting scheme.

**London: Hammersmith.**—An application is to be made to the L.C.C. for sanction to a loan of £10,000 for additional machinery, mains, transformers, meters, and services.

**Middlesbrough.**—Cable to supply North Ormesby district at an estimated cost of £550.

**Selby.**—A special meeting is to be held to consider the question of electric lighting.

**Watford.**—A loan of £1,331 for meters has been sanctioned.

**Winchester.**—One 500-kw. D.C. turbo-generator, condensing plant, &c. City Electrical Engineer. Dec. 17th.

**Worcester.**—The question of adopting electricity for all purposes at the sewage works is under consideration.

### Wiring

**London: L.C.C.**—160 wiring points at Star Lane Elementary School. Clerk. Dec. 9th. (See advertisement on another page.)

**Paddington.**—Central Baths, Porchester Road. Nov. 26th. Town Clerk.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Aberdeen.**—Examination Hall at King's College (£14,000).

**Birmingham.**—Electrical equipment of infirmary at an estimated cost of £7,600.

**Colchester.**—Additions to hospital (£3,110).

### Miscellaneous

**West Ham.**—Three months' supply of electrical fittings for the Guardians. Clerk, Union Road, Leytonstone, N.E.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £58 5s. to £58 15s. (Last week, £55 5s. to £55 10s.)

**Change of Telephone Number.**—The telephone number of the General Electric Co., Ltd., Glasgow Branch, is now 309 Central, 4 lines.

**Agency.**—We are requested to state that the address of the Irish agent of Simplex Conduits, Ltd., is 88 Wellesley Avenue, Belfast.

**Russian Agencies.**—The Board of Trade Intelligence Department has the name and address of a gentleman in Kharkov who wishes to take up an agency of British firms dealing with electric tramways, electric lighting, and equipment of mines.

An engineer in Ekaterinoslav also desires to obtain supply of metal- and carbon-filament lamps, dynamos and motors, ventilators, and other electrical apparatus.

**Dutch Agency.**—An Amsterdam firm wishes to secure the representation of United Kingdom manufacturers of electric motors. Further particulars at 73 Basinghall Street, E.C.

## APPOINTMENTS AND PERSONAL NOTES

Mr. P. Walter d'Alton, for many years Chief Mechanical Engineer on the staff of Messrs. Dick, Kerr & Co., has opened offices at Cross Keys House, 56-58 Moorgate Street, and begun practice as a Consulting and Inspecting Engineer.

Mr. G. S. Helme has resigned his appointment of representative of the Electrical Co., Ltd., in Scotland.

The East Indian Railway Co. requires an assistant elec-

trical engineer. Salary 450 rising to 600 rupees per annum. Four years' agreement. Secretary, Dec. 7th.

Electrical fitters are required at H.M. Dockyard, Portsmouth. Applications to Electrical Engineer, Portsmouth Dockyard.

Shift engineers are required at Belfast and Birmingham; a switchboard attendant at Watford; a draughtsman in the Stoke-on-Trent Tramways Depot; and a testing assistant by Messrs. Bruce Peebles & Co.

## LOCAL NOTES

**London: St. Pancras: Purchase of Copper.**—As reported in our columns a short time ago, the Council has decided to replace the old Henley cable in the Borough by new feeders, the work to be carried out as occasion requires, in order to alleviate as much as possible the anticipated distress amongst the unemployed due to the war. In the ordinary course the cable would have been ordered as required at the lowest prices quoted. The present lowest price quoted is for copper at £57 per ton, but the Western Electric Co. has informed the Electricity Committee that they have had the opportunity of purchasing a sufficient quantity of copper for the Council's cable requirements for the next two years at the very low price of £54 per ton, and the Company is prepared to do so if desired. The Committee recommend that this suggestion be adopted, the Company merely buying in advance on behalf of the Council and charging as the various quantities are ordered. Thus the charge for cable will only vary according to the price of lead at the date of order for each consignment.

**Marylebone: Battery Maintenance.**—The dispute between the Council and the Electrical Power Storage Co., which has been going on for some time and related to the maintenance of the batteries at the Rathbone Place and Manchester Square sub-stations, has now been settled after reference to Mr. J. Swinburne, F.R.S., as arbitrator. The Council had claimed that the Company had been lax in their maintenance of the batteries in question, but a compromise has now been arrived at apparently satisfactory to both sides.

**Willesden: Supply to Guardians.**—Some time ago the Guardians entered into an agreement to dismantle their own generating plant and take current from the Council. They now report that during the year to Oct. 19th, 1914, there has been a net increased cost of £363 over that incurred when using their independent plant. A suggestion is made that the agreement should be cancelled, but the Council are not willing to adopt this course. The Guardians therefore have accepted a proposal that they shall cease taking current from the Council from Dec. 1st for a period of twelve months, and during that time use their own plant, retaining the Council's supply as a stand-by on terms to be agreed. This, it is thought, will enable a more efficient test to be made as to the comparative cost of the two methods of supply.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Edison & Swan United Electric Light Co.**—At the annual meeting last week the report and accounts given in our issue for Nov. 12th, p. 594, were adopted. Mr. C. J. Ford, the Chairman, who presided, said that the works were at present very full, and so far the company had not felt any ill effects from the war. The war had had one beneficial effect in stopping the importation of German lamps, &c., and he hoped that after the cessation of hostilities the British public would continue to decline to purchase these German goods, and wholeheartedly support British manufacturers. The company had brought their goods prominently before the public by means of advertising, and he was pleased to say that the results obtained had in every way warranted this expenditure.

**CAPPER PASS & SON, Ltd.,**  
Bedminster Smelting Works, BRISTOL.

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**ANTIMONIAL LEAD OF ALL GRADES**  
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# ELECTRICAL ENGINEERING

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**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 414 [VOL. X., No. 49]  
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THURSDAY, DECEMBER 3, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

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OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

*Other Advertisement Rates on Application.*

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Letters for Insertion, *Tuesday first post.*

Small Advertisements and Official Announcements, *Wednesday first post.*

Displayed Advertisements, *Tuesday first post.*

Corrections in Standing Advertisements, *Monday first post.*

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Telegrams: "Cireling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE new three-phase power house adjoining the old continuous-current station at Hackney and the new sub-stations required for the introduction of three-phase transmission into the system are now working. A description of the plant is given (p. 616).

DR. A. H. RAILING's address to the Birmingham Local Section of the Institution of Electrical Engineers contained a general survey of the position of electrical engineering in civilisation (p. 617).

THE Nottingham Electricity Department make a charge for providing a consumer's fuse-box. A consumer disputed their right to make this charge, but the Judge held that it was justified (p. 617).

IN our "Questions and Answers," the construction of a search-coil for fault localising is dealt with (p. 617).

THREE new types of electric miner's lamps have been approved by the Home Office (p. 618).

THE maintenance of electric miner's lamps was dealt with in a paper recently read by Mr. W. Maurice before the Association of Mining Electrical Engineers (p. 618).

PATENT specifications relating to electric miner's lamp igniters and electric furnaces have been published during last month (p. 620).

THE subjects of the specifications published at the Patent Office last Thursday include metal filaments, cookers, soldering irons, engine starter, automatic telephones, and insulated rail joints. A patent for neutralising static charges appearing on textile materials during manufacture expires this week (p. 621).

THE third rail system is being employed in America for pressures as high as 2,400 volts (p. 621).

SOME American investigations into the variations in the absorption of the electric waves used in wireless telegraphy are referred to (p. 621).

THE Advanced Grade Question Paper in Lundbergs' Electric-Light Switching Competition is published on p. 622.

OUR Trade Section describes a new electric heater for fixing on doors, and refers, among other subjects, to shop lighting, new fittings, and recent designs of switchgear (pp. 623 and 624).

TWO 8,000 kw. turbo-generators are required by the L.C.C.; further borrowing powers of £543,000 are contemplated by the Manchester Corporation; and loans are contemplated at Stoke-on-Trent, £44,000; Oldham, £40,000; Redditch, £18,000; and Islington, £4,975.—Two water-tube boilers are required at Tunbridge Wells (p. 625).

THE Yorkshire Electric Power Co. is renewing its application to Parliament for lighting powers.—Some satisfactory street lighting tests have been carried out at Peterborough.—A point in connection with consulting engineers' etiquette has arisen at Slaithwaite (p. 626).

**Arrangements for the Week.**—Tuesday, Dec. 8th.—Institution of Electrical Engineers, Scottish Section, at 207 Bath Street, Glasgow. "The Magnetisation of Iron at High Flux Density with Alternating Currents," by J. S. Nicholson. 8 p.m.

Wednesday, Dec. 9th.—Association of Engineers-in-Charge. St. Bride's Institute, Bride Lane, Fleet Street, E.C. "Electricity in the Printing Office," by Frank Broadbent. 8 p.m.

Thursday, Dec. 10th.—Institution of Electrical Engineers. "Automatic Protective Switchgear for Alternating-Current Systems," by E. B. Wedmore. 8 p.m.—Greenock Electrical Society. "The Electrical Equipment of a Liner," by J. E. Allan.

Friday, Dec. 11th.—Electro-Harmonic Society Smoking Concert, Holborn Restaurant. 8 p.m.

**Institution of Electrical Engineers.**—The following is the result of the ballot at the meeting on Thursday:—*Member*:—A. McKinstry. *Associate Members*:—A. A. Anderson, Lieut. B. Binyon, R.N., W. De Renzy, W. H. Lang. *Graduates*:—T. M. Carey, T. J. Dale, W. C. Harrison, A. W. Marr, H. Norman, H. A. Rickwood, R. S. Whaley. *Students*:—G. J. Abbott, C. Dawnay, H. W. Gilbert, C. L. Hyde, L. A. Khan, C. F. Partridge, S. R. Sahgal, H. E. Skinner, C. H. Stubbings, J. T. Tosta.

*Candidates transferred*:—*From Associate Member to Member*:—J. A. Hay, W. S. Lonsdale, J. C. Matthews, E. H. Westwood. *From Graduate to Associate Member*:—H. Price. *From Student to Associate Member*:—H. Carey-Thomas, W. M. Cranston, L. W. Goddard, C. H. Goulden, L. C. Martin, W. B. Smith. *From Student to Graduate*:—J. P. Annacker, C. C. Brazier, P. S. Dubash, L. P. Hugo, F. P. Matthews, J. W. Munro.

**The Crystal Palace School of Engineering.**—We are requested to state that the present occupation by the Admiralty of the Crystal Palace does not in any way affect the School. The work, which is now entering on its forty-third year, is being carried on as usual, and the School is being developed and extended under the auspices of the Trustees.



### THREE-PHASE SUPPLY AT HACKNEY

AT the invitation of the Electricity Committee of the Hackney Borough Council, a number of visitors were given the opportunity last Saturday of inspecting the 3-phase plant in the Hackney generating station and one of the sub-stations which has just been completed. The Hackney electricity undertaking dates from 1901, and up to this last extension, only continuous-current plant was in use. In 1912, however, a new scheme was prepared by Mr. L. L. Robinson, Borough Electrical Engineer, and approved by Messrs. Preece Cardew & Snell, which involved the erection of an entire new 3-phase power-house adjoining the old one in Millfields Road, a ring main system, and three sub-stations. The first instalment of this plant is now complete and forms a fine example of modern central station equipment. The occasion of the inspection was quite informal, but over 100 persons were entertained to tea at the station, where a speech of welcome was made by the Mayor, Mr. L. S. Johnson, after which Mr. T. A. Blane (Chairman of the Electricity Committee) called attention to the financial side of the undertaking, and Mr. Robinson modestly referred to the technical features of the scheme for which he is responsible. Most of the company were then taken in cars, kindly provided by the Council, to the Dalston Lane sub-station, where the converting plant and distribution arrangements were inspected.

The new power-house strikes us at once as spacious, well-arranged, and straightforward in its design. The engine-room is in line with the old engine-room, and the new boiler house is at right angles, both arranged to be capable of considerable future extension. Steel frame construction with concrete panelling is employed, and the whole structure is as fireproof as possible. In the engine-room, there is room for one 3,000 kw. and two 5,000 kw. turbo-alternators, of which the first is now running, and one of the latter is on order. Between the main part of the new engine-room and the old, a 1,500-kw. Bruce Peebles-La Cour motor-converter has been installed, which forms the electrical connecting link between the old and the new plant. The new generating set consists of an alternator made by the General Electric Co., Ltd., rated at 3,000 kw. at 0.85 power factor, 6,000 to 6,600 volts, three-phase, 50 cycles, at 1,500 r.p.m., and capable of 50 per cent. overload for half an hour, and 25 per cent. for two hours. The machine is ventilated by air drawn through a Baleke dry cloth filter, and a separate exciter is coupled to its shaft. The set is driven by a standard turbine of the disc and drum type manufactured by Willans and Robinson, Ltd. (Rugby). The following details of steam consumption will be of interest:—

*Steam pressure, 200 lbs. per sq. in., steam temperature, 550° F.*

Steam consumption in lbs. per kw. hour			
Load.	Guaranteed.	Expected.	Vacuum.
$\frac{1}{2}$	15.25	14.75	28 ins.
Full	13.95	13.5	28 "
$1\frac{1}{2}$	15.25	14.75	26.8 "
$1\frac{1}{2}$	16.9	16.3	25 "

The above figures include the steam for the augmentor set.

The condenser plant, also by Willans and Robinson, is, as usual, underneath the set, and is equipped with an Edwards' type air pump, with separate force pump, driven by a B.T.-H. motor. Condensing water is derived from the river, and two 36-in. pipes are provided from the pump house on the bank, which contains a vertical shaft Rees Roturbo pump, driven by a Laurence Scott motor.

The new boiler house at present contains two Babcock and Wilcox land type water-tube boilers with chain-grate stokers and superheaters, each capable of evaporating 33,000 lbs. of water per hour, and working at 200 lbs. per sq. in., with superheat up to 600° F. The ejector type of force draught equipment is fitted, with a fan by Davidson & Co., driven by a Westinghouse motor. A 520-tube Green economiser is provided above the back of the boilers, and steam driven air pumps, by J. P. Hall & Co., are used. A very complete coal handling plant has been provided by W. J. Jenkins & Co.; this takes coal from the adjoining river and conveys it along a telfer line to the overhead bunkers. The coal is weighed on the start of its journey, as well as when it leaves

the bunkers, on entering a travelling shoot which can deliver coal from any of the four bunker outlet valves to any stoker. The motor driving all this plant was supplied by the British Thomson-Houston Co., Ltd. All the auxiliary motors are run from the continuous current bus-bars and are controlled by substantial pillar type motor panels by Brook, Hirst & Co. With regard to the steam side of the equipment, it only remains to say that the contractors for the pipe work were the Brightside Foundry & Engineering Co., Ltd., and that the steam valves are of the Hopkinson pattern.

The main switchgear is of the standard Ferranti type with all the H.T. gear in cells in a room directly under the control board. The oil switches are hand-operated by levers of the signal-box type. Duplicate bus-bars are provided, and panels are provided for one 3,000-kw. and one 5,000-kw. alternator, the 1,500-kw. motor-converter, and two 0.15 sq. in. three-core feeders. A Taylor-Scotson regulator is installed for voltage regulation, and Merz-Price protection is provided for the feeders. The connecting cables to the machines were supplied by British Insulated & Helsby Cables, Ltd. They are three-core, paper-insulated, lead-covered, armoured where subject to rough usage, and with copper shield where employed for extra high tension.

The La Cour converter already referred to has a rated D.C. output of 1,500 kw. at 500 to 575 volt., and runs at 273 r.p.m. When running inverted it gives 1,350 kw. at 6,000 to 6,600 volts 50 cycles three-phase in parallel with other machinery. The guaranteed efficiencies are as follows: A.C. to D.C., full load, 92.25 per cent., three-quarter load, 91.75 per cent., and half load, 90.5 per cent.; D.C. to A.C., full load, 91.5 per cent., three-quarter load, 91 per cent., half-load, 89.5 per cent. The starting current from A.C. to D.C. is 30 per cent. of full-load current, and from D.C. to A.C., 10 per cent. The set can be started from either side.

The E.H.T. mains from the station to the new sub-stations are of some interest, and are laid in fibre conduits of the well-known and excellent type made by the Key Engineering Co. These conduits are 4 in. internal diameter with turned socket joints lapped with compounded tape. They were laid in concrete by Foot & Milne, Ltd. The line of this conduit extends from the power-house to the Northwold Road sub-station, thence to the Dalston Lane sub-station on to Balcombe Street sub-station, and back to the power-house. The shortest routes have not been taken, but consideration has rather been given to positions it will be desirable to connect on to the ring mains in the future. The length of conduit line is about 10,000 yds. Six conduits are provided round the northern half of the ring and nine conduits round the south; a total of about fifty miles of actual conduit is therefore used. It may be noted that the capacity of the system when these conduits are filled can be immediately doubled by laying a set of conduits diametrically across the area from the power-house to Dalston Lane sub-station. The main feeder ring drawn in at present consists of one 0.15 sq. in. three-core paper-insulated copper-shielded lead-covered cable, made by British Insulated & Helsby Cables, Ltd., and laid by the works staff. In addition, pilot and signal cables have been drawn in for working in connection with the Merz-Price protection gear, &c. The former is a three-core paper-insulated lead-covered cable, and the latter is a six-pair dry-core, lead-covered cable.

At present the capacity of the plant in each of the three sub-stations is 1,100 kw., but there is room for considerable extension and for the addition of a battery at each. Also the old station will gradually become a fourth sub-station. The converting plant consists of two 500-kw. La Cour converters, supplied by Bruce Peebles & Co., Ltd., at each sub-station. The sub-station switchgear is by Johnson & Phillips, Ltd. It may be mentioned that spark-gaps and "Brazil" carbon trough resistances are installed for dealing with surges in the E.H.T. system.

A certain amount of low-tension feeder cable has been supplied in connection with the new scheme by British Insulated & Helsby Cables, Ltd., consisting of concentric and triple concentric cables, paper insulated and lead covered, either armoured and laid direct in the ground or on the solid system in earthenware troughs. Very few new feeders will be required for many years to come, as existing feeders, which used to carry the supply from the works right across the area and necessarily working at a low-current density, are being cut near the sub-stations and looped in. Thus each old long feeder will become three short feeders, which can be worked at a much greater current density. Thus the energy carrying capacity of the old copper will be increased nearly six-fold.

## ELECTRICAL ENGINEERING AND PROGRESS

IN his chairman's address to the Birmingham Local Section of the Institution of Electrical Engineers, Dr. A. H. Railing made a comprehensive review of the position of electrical engineering in the world's social organisation. He considered how the evolution of civilisation had led to an age of specialisation, and how electrical engineering, one of the latest of the professions, came into being as a separate entity. He then started to answer the question of how far electrical engineering had in its turn contributed to human development, progress, and efficiency. He attacked the matter in some detail, and in a reasoned argument, illuminated with a fine blend of exact science and philosophic speculation, he showed how electricity was the most easily converted, transmitted, and applied form of energy, and had enabled us to make better use of matter by increasing the number of varieties in existence, by producing them more cheaply, and by making better use of their properties; it had enabled us to make better use of the available energies, and by facilitating locomotion and communication had increased the space that could be inhabited and made use of by men, and it had increased the physical and mental power and efficiency of individuals and human society as a whole. Summing up, he said:—"Electrical engineering has led to better understanding, a more extended use, and a more efficient use of nearly all existing matter and energy. It has led to a better understanding of animal and human organisms and problems. It has bridged space and time and minimised their influence where they become resistance factors against energies mental and physical; it has increased the efficiency of individual and society; it has, therefore, established its claim to be one of the most valuable factors in the progress of mankind."

## WHO SHOULD PAY FOR THE SERVICE BOX

JUDGMENT was given in the Nottingham County Court in an interesting case in which the Nottingham Corporation sued a consumer for 9s. 6d. for a fuse-box in his house. From the evidence given by Mr. Herbert Tulbot, the City Electrical Engineer, it appears that consumers have hitherto always paid a charge for their fuse-boxes, without disputing it. In the present case, however, there was the additional reason for the consumer to pay because he was not satisfied with the box he had had previously, and wanted a new one. The judge gave his decision in favour of the Corporation, adding that he considered the charge for a terminal box justified in accordance with the Electric Lighting Acts, which permit of a charge being made for "electric lines" within consumers' premises. "Electric line" is defined in the Acts as "a wire or wires, conductor . . . or any apparatus connected therewith." We hardly expect that the defendant in this case will appeal, as the amount in question is so small, but it is a question upon which it would be useful to have a decisive opinion. Under the Board of Trade regulations, the supply authority is bound to insert a service fuse in a locked or sealed receptacle in the consumer's premises, and except in particular cases in which a special pattern of fuse or box has been required by the consumer, it has been unusual to charge for this.

**Municipal Wiring.**—A number of municipalities will ask for powers next session to deal in electric wiring and fitting, and also to hire out motors and apparatus. The Edinburgh Corporation seeks only to hire out motors and cooking, heating, and ventilating apparatus, also to maintain showrooms. The Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board merely asks for power to maintain showrooms. In the Plymouth Corporation Bill it is proposed to sell or hire electric fittings, and to fix same; the Doncaster and Dewsbury Corporations seek to deal in apparatus for both lighting and power and similar powers, whilst the South Shields Corporation is still more specific, and proposes also to "supply and fix wiring, and to demand and take rents and charges therefor."

**The Association of Supervising Electricians.**—Mr. A. H. Dykes presided at the annual dinner of this Association last Saturday, and in his principal speech paid a glowing tribute to the work of British electricians at the front, and referred with approval to the Association's encouragement of the apprentice system. The sum of £4 12s. was subscribed for the Belgian refugees during the evening, and an excellent musical entertainment was provided. The total membership is now seventy-two.

QUESTIONS AND ANSWERS  
BY PRACTICAL MEN

## RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

## QUESTION No. 1,419.

Describe briefly the general design and give particulars of efficiency and working of static balancers for use with 440-volt 3-wire D.C. dynamos, which can be worked either shunt or compound wound, whichever is the more suitable. Two generators will be used of 100 and 50 kw. respectively, both direct-coupled steam sets, running in parallel when the load is heavy; further, for peak loads a battery is also put in parallel. The plant is used for factory driving and lighting. The battery has to be charged during the daytime. State briefly also what extra switchgear and instruments would be required.

(Answers must be received not later than first post Thursday, Dec. 10th.)

## ANSWERS TO No. 1,417.

I wish to construct a suitable search coil for fault localising, and should be grateful if anyone will furnish me with particulars of wire to be used and the gauge and length required to give an audible buzz when passing about 10 amps. through the fault by means of an interrupter, and also the resistance of a "buzzer" to suit.—"ALPHA."

An award of 10s. is made to "FAULT" for the following reply:—

The following is a description of a search coil for fault localising, constructed by the writer and used with success.

The coil is wound on an equilateral triangular frame, 12 in. side and 3 in. wide, and of  $\frac{3}{8}$ -in. wood; 1,000 turns of No. 30 S.W.G. double cotton-covered wire are employed. The coil is wound in sections and connected together in series, making sure that the ends are connected together properly. The ends are connected to the buzzer by means of a strong flexible cable. For a buzzer the writer used a pair of fairly high resistance telephone receivers connected in series, which were mounted on a frame to fit the operator's head.

"Fault" assumes that by the term buzzer, "Alpha" means the telephone which is connected to the search coil and emits the buzz, and not the interrupter.

No second award is made, but we may mention that, in an interesting communication "L. R." (who wrongly recommends a circular search coil) points out that some care will have to be taken in constructing an interrupter to make and break 10 amperes in the cable circuit, and suggests that a much smaller current should be used.

## ANSWER TO CORRESPONDENT

**R. HORE.**—All that is required to increase the speed of your shunt-wound motor is to insert a resistance in the field circuit to weaken the field. The machine, however, when running on a weak field in this way will not have such a good overload capacity.

**The Association of Consulting Electrical Engineers.**—We have received a copy of a booklet which the Association has issued for the guidance of the public and the profession containing a scale setting out the usual professional fees, and the rules under which the members of the Association work.

# ELECTRICAL ENGINEERING IN THE MINING AND METAL INDUSTRIES

Published on the First Thursday of each month

## ELECTRIC MINERS' LAMPS

A HOME OFFICE Order (No. 1,510) approves the following additional types of electric miners' lamps:—  
*The Bristol Safety Lamp, Type B.T. 4 V.* (made by the Bristol Electric Safety Lamp Works, 40 Great Smith Street, Westminster).

A section of this lamp is shown in Fig. 1. It has a case of steel, brass, aluminium, or aluminium alloy, and the accumulator is constructed to prevent escape of the liquid whilst allowing the escape of gas generated by chemical action. The cover, hinged to the case, forms a flame-tight connection with it, and a base plate or bezel of aluminium or brass, secured to the cover, carries the bolt, reflector, protecting glass, and guard; the glass is cemented to a retaining ring screwed to the base-plate and locked to a brass slide by a pin, and held in the locked position when the cover is closed by another pin on the upper edge of the case, which projects through the case and engages a hole in the slide. The slide bracket is screwed to the cover from the inside. The flame-tight switch consists either of a metal sliding plate, the outward movement of which is limited by a pin or a rotary stem working in a tube. A flame-tight joint between the external end of the tube and the head of the stem is maintained by a washer of vulcanite or suitable material, close contact being ensured by a spring.

The lamp is specified to weigh not more than 4½ lb., and to give 1 c.p. all round and 1½ c.p. over an arc of 45° in a horizontal plane for nine hours.

*The Manley and Sandy (M. & S.) Miners' Electric Safety Lamp (with Electric Gas Indicator)* [made by Manley & Sandy, Ltd., Letchworth.]

The cover of this lamp, which is shown in Fig. 2, carries a hollow aluminium cylinder with a flanged base by which the cylinder is secured to the cover, the cylinder forming a flame-tight joint with the cover by means of steel screwed pins riveted on the inside of the cover. The cylinder contains an electrical device constructed for the purpose of indicating the presence of fire-damp. Communication with the outside atmosphere is made through an opening covered by double securely fixed gauzes of not less than 28 S.W.G. steel or copper wire, 784 meshes to the square inch. The cylinder is provided with an aluminium top plate which carries the bulb and a conical reflector, and forms a seating for the protecting glass. The base of the flanged cylinder carries 4 or more steel or iron pillars which support the aluminium crown. An aluminium plate carrying a conical reflector is screwed into the crown and is firmly secured thereto by a set screw locked by a soldered steel wire. The flame-tight screw switch operating the lamp, and a flame-tight spring switch operating the gas-indicating device, are both situated in the aluminium cylinder.

It is pointed out that this lamp has passed the official tests with the electrical gas-indicating device embodied in its construction, but the device itself does not require the approval of the Secretary of State, and its efficiency as a means of indicating gas has not been tested.

The *Bristol Safety Lamp Type B.R. 4 V.* is also approved for use by officials or for special purposes only. It is a modification of the Bristol lamp described above, but of the bull's-eye pattern.

The complete list of approved electric mining lamps is now as follows:—

*For General Use.*—"Bristol, Type B.T. 4 V." (Bristol Electric Safety Lamp Works), "B.A.C." (British Accumulator Co., Ltd.), "Ceag" (Ceag Electric Safety Lamp Co.), "Turquand-

Kingsway" (General Electric Co., Ltd.), "Gray-Sussmann, Nos. 3 and 4" (W. E. Gray), "Manley and Sandy (M. & S.)" (Manley & Sandy, Ltd.), "Joel-Fors, Type 403 M." (John Mills & Sons).

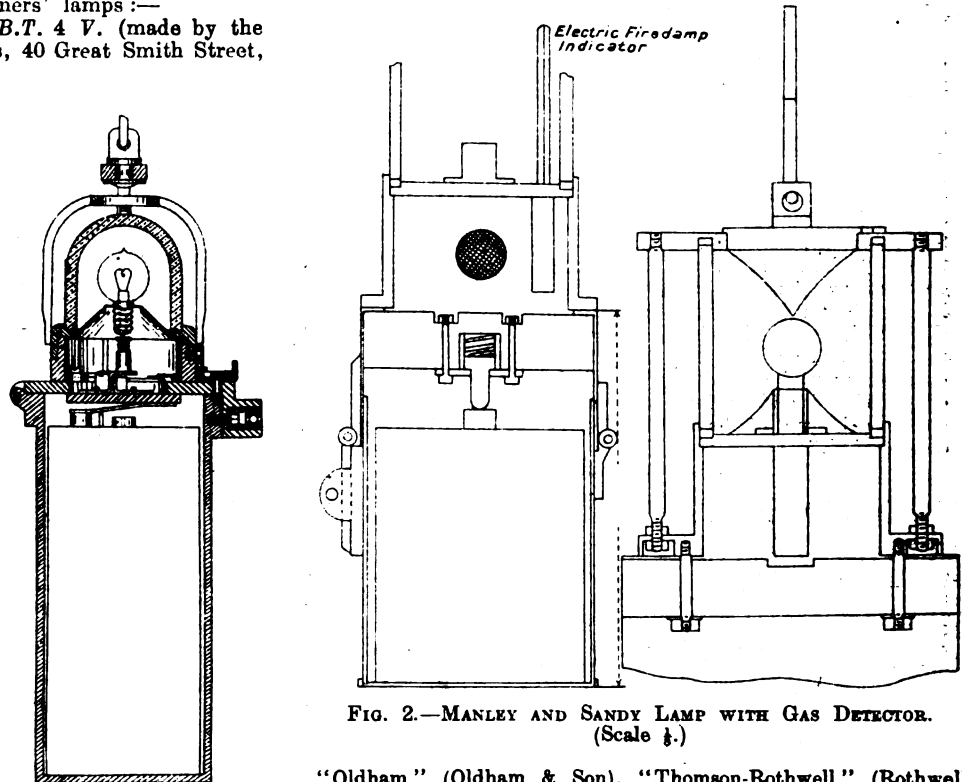


FIG. 1.—BRISTOL SAFETY LAMP.

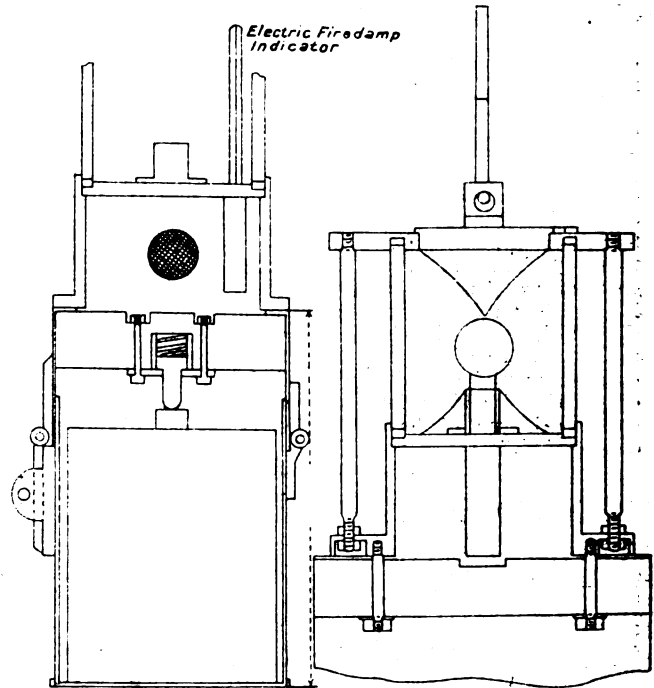


FIG. 2.—MANLEY AND SANDY LAMP WITH GAS DETECTOR. (Scale ½.)

"Oldham" (Oldham & Son), "Thomson-Rothwell" (Rothwell & Co. and the Thomson Co.), "Varta" (Tudor Accumulator Co., Ltd.), "Wolf, Alkaline," "Wolf, Lead," and "Wolf, No. 2" (Wolf Safety Lamp Co.).

*For Officials and Special Purposes only.*—"Bristol, Type B.R. 4 V." (Bristol Electric Safety Lamp Works), "Float Patent" (Float Electric Co., Ltd.), "Joel-Fors Electric Inspection Lamp, Type 303 C." and "Joel-Fors Electric Hand Lamp, Type 403 H." (John Mills & Sons), "Oldham Emergency" and "Oldham Shaft and Roadway, Types A and B" (Oldham & Son), "Varta, Type 2 Et 4" (Tudor Accumulator Co., Ltd.), "Wolf Rescue, No. 2" (Wolf Safety Lamp Co.).

## THE MAINTENANCE OF ELECTRIC MINERS' LAMPS

A LECTURE on this important subject was given by Mr. W. Maurice recently to the Warwickshire and South Staffordshire Branch of the Association of Mining Electrical Engineers. He emphasised the importance of not trusting the upkeep of such lamps to incompetent persons, and remarked that the care of storage batteries had always been a specialised branch of electrical work. He suggested that the electric lamp cabin ought to come under the supervision of the electrician of the mine. Complaints that electric lamps were unduly expensive to maintain were usually the result of bad management of the batteries. With 500 lamps the cost should not exceed 3d. or 4d. per week per lamp. The organisation of the lamp cabin for lamps with lead and alkaline batteries was much the same. Every cabin should have suitable charging apparatus whereby accumulators could be placed on stands and charged automatically in groups, and at the same time provision should be made for the cleaning and the washing-out of the cells, and the systematic handling of the lamps. For such repairs as might be rendered necessary in ordinary daily work, such as the dealing with some trivial damage to the casing and the cleaning of the glass or attention to the bulbs, suitable facilities should be provided. He would suggest that when they designed a cabin for a fairly large number of lamps, they should also provide

a photometer room in which photometric tests could be made. The lamp-room should be furnished with a proper supply of hot and cold water, and it would be all the better if stills were provided for the production of distilled water. The two main items in lamp-cabin costs were bulb renewals and battery renewals. If they were getting a life of 800 or 900 hours out of a 1½-c.p. bulb, they had no reason to make any complaints. Quite an appreciable amount of the life of the lamp was wasted, due to the inveterate habit of the miner of returning his lamp still alight, and quite a large proportion of the damage was due to his worse habit of banging the lamp down at the lamp-room window when handing it in. The simple expedient of a rubber mat had been found of great use in this direction. There was also great roughness in the way lamps were hit against the un-locking magnets.

As to the treatment of the battery, most of the storage batteries on the market were fitted in celluloid shells, with some kind of non-spilling valves which provided for the escape of gas when the batteries were being charged. To get the best results out of a lead accumulator it was necessary to charge it at a certain rate, and if that rate was exceeded the life of the plates would be very considerably reduced. At many collieries it had been the practice almost to ignore any such triviality as the rate of charging.

With regard to the lead accumulator and the length of its life, they might put that down as from 300 to 400 shifts, which was equivalent to about once a year.

Sometimes the negative would go twice as long as the positive, but sometimes it would not, and it was considered at some collieries a good rule to take them both out at the same time rather than to have the trouble to change first the positive and then the negative. The celluloid cell cases varied a great deal in quality. There was not the slightest economy in cheap cases. Heavily-built cases with easily detachable lids would stand refilling for a number of years. Reasonable care had to be taken to keep the celluloid away from sources of heat, owing to its inflammability, but the fire risk from this cause had been greatly over-estimated. Cleanliness in handling the lamps was essential; dirty contacts and terminals, and even handling the lamp-bulbs with oil fingers, had a marked effect on the light given. The lamp-bulbs should last from 800 to 900 hours. Many cells were ruined by being connected the wrong way round for charging, and he recommended the adoption of a wedge-shaped block at the base of the cell, so that it could only be inserted in the rack the right way. Wolf alkaline cells required very little special treatment. The whole secret of maintaining them in perfect condition lay in scrupulous cleanliness, keeping up the strength of the electrolyte, and taking every precaution to avoid the admission into the cells of dirt, and especially oil which, when mixed with the alkali, caused the formation of soap.

## ELECTRICAL MINING AND METALLURGICAL PATENTS OF NOVEMBER

### Mining.

THE only patent specification of special interest to mining electrical engineers published during last month by the Patent Office was No. 15,324, of 1914, of V. E. JOYCE and SPAGNOLETTI, LTD. This describes a simple form of electric relighting apparatus for miners' oil lamps, for use above ground. It consists of a stand containing a magneto-generator, worked by a handle through gearing, with the lamp contacts mounted on the top of the stand. The apparatus is for use only on the surface or in non-gaseous mines, as the lamp is not enclosed in a gas-tight chamber.

### Metallurgical.

A patent specification by F. J. MACHALSKE (No. 15,455, of 1914) published last month describes an electric furnace for smelting iron in which the bottom and lower portions of the sides are coated with artificially-made graphite carbon, while the adjacent parts of the walls are covered with magnesite.

**Home Office Prosecution.**—Last month the Greenside Mining Co., Ltd., and their manager, Mr. W. H. Borlase, were charged at Hackthorpe with using an electric locomotive with overhead conductors without consent of the Home Secretary. The defendants raised an objection on the ground that the special rules in question had not been received when the offence was committed. This objection was upheld by the Bench, but costs were not allowed.

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## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published Nov. 26th, 1914

A full list of electrical patents published last week appeared in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

22,331/13. **Lamp Filaments.** C. O. BASTIAN. Helically-wound drawn wire filaments in which the wire is provided with a coating during preparation to keep the convolutions apart. This coating is removed after mounting the filament.

23,218/13. **Cookers.** R. S. DOWNE and the BROMPTON & KENSINGTON ACCESSORIES CO., LTD. Electric cookers comprising ovens with an inner shell of thin sheet metal enclosed within an outer shell consisting of a metal frame and compressed asbestos sheet panels, the space between the two being filled with slag wool or other heat insulator. (Two figures.)

25,621/13. **Soldering Irons.** L. NEWITT and F. P. FLETCHER. Electrically-heated soldering irons, with a handle that can be adjusted as to its angular position, with the bit and with several sub-divisions of the heating element controlled by a switch in the handle. (Three figures.)

1,227/14. **Engine Starter.** H. LUCAS and W. G. TURNER. Electric engine starter in which the pinion is drawn into gear by a solenoid with two windings, one in series with the motor when starting and of sufficient resistance to obtain the low initial speed necessary for getting into mesh, and the other forming a shunt holding on coil. (Two figures.)

6,210/14. **Automatic Telephones.** G. BETULANDER. An addition to No. 29,615/13, describing an automatic telephone system in which all the connections are effected by relays. (Three figures.)

7,884/14. **Insulated Rail-joints.** B. R. WILLS and J. C. SYKES. Joints with enamel insulation, in which the fish-plates, &c., are coated electrolytically or otherwise with pure iron or copper to take the enamel well.

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** ST. HELENS CABLE & RUBBER CO. and WHITE [Wiring] 22,198/13.

**Dynamos, Motors, and Transformers:** PIEPER [Engine-starting motors] 29,504/13; KETCHUM and ANDREWS [Dynamos] 4,344/14.

**Ignition:** DE POORTHER [Sparking plugs] 25,531/13.

**Instruments and Meters:** LEENS [Recording instruments] 25,717/13, and 19,282/14; and [Potentiometers] 19,283/14.

**Switchgear, Fuses, and Fittings:** HOLT and SMITH [Switches] 25,833/13; BERRY [Fuses] 2,301/14.

**Telephony and Telegraphy:** WESTERN ELECTRIC CO. (*Woodward, for W.E. Co., U.S.A.*) [Welded contacts] 26,582/13, and [Selective signalling devices] 26,608/13; VON KRAMER and KAPP [Resonating relays] 27,063/13; GRAHAM [Telephones] 16,839/14.

**Miscellaneous:** NU-LINES MANUFACTURING CO. and CHAPMAN [Electric clocks] 25,184/13; PATTERSON [Miners' lamps] 25,210/13 and 21,968/14; JOSEPH [Sterilisation of water by ozone] 25,503/13; JEFFERSON [Ships' compasses] 103/14; HAMILTON [Pocket lamps] 3,643/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distribution:** HOCHSTADTER [Protective systems] 21,992/14.

**Instruments:** LINCOLN [Wattmeters] 21,792/14.

**Telephony:** OLSON and another [Inductances for multiple telephony] 22,133/14.

**Miscellaneous:** SIGNAL GES. [Sub-aqueous sirens] 7,281/14; GES. FÜR ELECTRO-OSMOSE [Method of influencing the electric charge of a diaphragm] 21,189/14.

### Opposition to Grant of Patents

129/14. **Fire-damp Indicating Device.** A. and L. D. WILLIAMS. Opposition to the grant of this patent has been withdrawn (see ELECTRICAL ENGINEERING, Aug. 6th, p. 446).

### Expiring and Expired Patents

The following Patents expire during the current week, after a life of fourteen years:—

22,372/00. **Discharging Electrified Material.** J. G. WHITE & CO., LTD., and J. G. WHITE. Means for discharging or neutralising static charges formed on textile material during manufacture.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** W. E. LAKE (*Standard Varnish Works, U.S.A.*) [Insulating compounds] 16,885/08.

**Dynamos, Motors, and Transformers:** SIEMENS BROTHERS & CO., LTD. (*Siemens Schuckertwerke*) [Ventilation of dynamos] 16,300/05; DUPONT and HARLÉ & CIE. [Motor control] 17,137/08.

**Switchgear, Fuses, and Fittings:** M. KALLMANN [Motor control with iron-wire resistors] 16,292/05; J. P. JAKOBSEN and H. F. JENSEN [Switches] 25,551/09.

**Telephony and Telegraphy:** A. POLLAK and G. EGGER [Telegraph perforators] 17,718/02; J. E. KINGSBURY (*Western Electric Co., U.S.A.*) [Telephone transmitters] 17,048/08.

**Miscellaneous:** D. PERRET [Electric clocks] 16,814/04.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

A Paper by Mr. A. H. Taylor, published in the *American Physical Review*, describes some investigations into the diurnal and annual variations in overland radio-transmission, leading to conclusions which are summarised as follows:—Overland daylight absorption of electromagnetic waves is several times greater than overseas absorption calculated from the Austin formula. Overland daylight absorption is, unlike overseas absorption, not constant. Overland daylight transmission on long waves is much stronger between Grand Forks and Washington (1,400 miles) in winter than in summer. Overland nocturnal transmission varies with the time of year to a different degree, depending on the nature of the country traversed. The Mississippi Valley shows a very wide variation in summer and winter transmission.

The net traffic receipts of the Pacific Cable Board for the year to March 31st, 1914, exceed those of the previous year by £80,028, and the receipts exceeded expenditure by £21,376. The general expenditure increased by £8,571 due mainly to the installation of an electric lighting and refrigerating plant at Fanning Island.

The Ottoman office notifies that the Bulgarian language is also admitted in telegrams for Turkey.

### ELECTRIC TRACTION NOTES

A description is given in the *Electric Railway Journal* of the equipment of certain lines of the New Michigan and Chicago railway, which is the first 2,400-volt continuous-current line to employ a third rail. The line will be ready for traffic shortly. The third rail is carried on special single-petticoat insulators 8½ in. high. A hole in the base of the insulator fits tightly over a casting screwed to the sleeper, and a similar hole in the top of the insulator takes the clip holding the contact rail. Both the rail and the insulator are held entirely by their own weight. The contact rail is placed 32 in. outside the adjacent track rail and 8½ in. above the track surface, except at turnouts, &c. At crossings an overhead wire is used, as is done in towns and villages. Owing to the position of the contact rail, the shoes project considerably from the side of the cars, and a folding bracket is provided so that they can be drawn in when passing through towns. The longest stretch of line is forty-two miles, and no feeders will be employed other than the 80-lb. low carbon conductor rail. Power will be supplied from both ends, however, as well as through a short cross line at a point about the middle.

## LUNDBERGS' ELECTRIC-LIGHT SWITCHING COMPETITION

(For Initial Announcement, and Particulars of Prizes, etc., see "Electrical Engineering" of Nov. 12th, p. 587.)

### RULES TO BE OBSERVED IN WORKING PAPERS.

1. Three Papers are set: Preliminary, Intermediate and Advanced. Any one of the three papers may be taken, but not more than one. The Preliminary Paper was published in "Electrical Engineering" of Nov. 19th, and the Intermediate Paper on Nov. 26th. The Advanced Paper is given below.
2. Competitors who have passed the Preliminary Grade on a previous occasion must take either the Intermediate or Advanced Grade. Those who have passed the Intermediate Grade must take the Advanced Grade. Those who have passed the Advanced Grade cannot enter.
3. When figure or page numbers are mentioned in the questions, they refer to the booklet "Lektrik Lighting Connections" (new 3rd Edition \*); by the help of which the paper may be worked.
4. Each answer must be done on a separate sheet (or sheets) of paper, on one side only; and each sheet must bear the writer's full name and address. It is not necessary to paste the questions on the answer paper.
5. Each answer must be numbered to correspond with the question.
6. Any competitor who does not wish his own name to appear in the published results should give a *nom-de-plume* or fancy name for this purpose. In all such cases, however, Rule 4 must be adhered to. In the published results only the names (or *noms-de-plume*) and the towns (not full addresses) of successful candidates will be published.
7. Answers to Papers must be addressed to the Editor of "Electrical Engineering," 203, Temple Chambers, London, E.C. Those from competitors living in or near the United Kingdom must reach the Offices of "Electrical Engineering" on or before Jan. 11th next, and the results will be published in "Electrical Engineering" of Feb. 25th, 1915. Answer Papers from far-off competitors must reach the Offices of "Electrical Engineering" by June 1st, 1915, and the results will be announced later.
8. The answer papers sent in will not be returned.

### ADVANCED-GRADE PAPER.

As many as possible of the following twelve questions should be answered.

1. What distinctions (if any) would you make between a Control Diagram, a Circuit Diagram, a Wiring Plan, and a Conduit Plan? Select a single circuit with which to illustrate your answer.
2. Show clearly how the construction of a "Pivot Intermediate" switch can be modified to form various other types of switch.
3. Sketch and describe some form of tumbler-switch control for a small single-phase motor.
4. Select one or more master controls suitable for:—  
(a) a shop, (b) a suite of offices, (c) a house, (d) one other situation.  
Show where the various switches would be placed in each case, and explain how the controls would be used.
5. Show by means of diagrams that the amount of perambulation of a room or other place for the purpose of turning electric lights on or off, in the course of a given period (say three months), is immensely reduced by the substitution of up-to-date controls for single-way controls. Give three examples.
6. Cite any instances that have come to your notice of the deplorable ignorance of the connections and conveniences of modern controls that exists in some quarters. As an example, there was a consulting engineer who objected to the use of "Twinob" switches because of the danger of short-circuiting!!
7. A "three-position" switch with four separate terminals and four fixed contacts has been designed for putting two lamps into series or parallel, and for lighting one only.  
Show what contacts would be interconnected in the up, middle, and down positions of the switch-knob, and also the external connections.  
Show further that this control is useful for heating apparatus.

\* For the convenience of our readers we have arranged to keep a stock of this Booklet and a copy will be sent by return of post on receipt of seven penny stamps. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203, Temple Chambers, London, E.C.

8. A cooking stove is controlled by a series-parallel-and-off switch, and is to be joined-up to one side of a three-wire system. Show that there are two ways of connecting the heating elements to the switch, and that one is in some respects better than the other in the above circumstances.

Which of the two methods would you use on an earthed concentric system of wiring?

9. There are at least four ways in which pilot switches controlling a group of two or more separate heater or other devices may be arranged to operate a single pilot lamp *P*:—

- (a) *P* lights up when any one or more heaters, &c., are switched on.
- (b) *P* glows dimly when one is switched on, and increases in brilliancy as more are put on.
- (c) *P* only lights up when all the heaters in the group are on.
- (d) *P* only lights up when all the heaters in the group are off.

Work out the connections for two groups, with three heaters in each group, for arrangements *a*, *b*, and *d*. Note that the switch for case *d* is different from any of those shown in Fig. 70.

10. Draw plans of the basement, ground, first, and other floors (if any) of a small building of any kind, with outbuildings (if any).

Indicate on the plans the positions of lights, &c. and switches; showing the various controls you would employ. The controls must be selected with discrimination, and the advantages secured by them briefly mentioned.

To simplify the diagrams, the leads to and from the distribution board (or boards) are to be left out, only those wires running between switches and lamps being shown completely. Thus the positive feeds to the switches, and the negative returns from the lamps, &c., may be indicated by short stumps of wire.

Only one kind of small premises must be dealt with; and this may be a house, combined house and shop, small factory, or any other kind of building.

11. In each of a number of vaults with entries at one end only, a single-way switch *S* and two-way switches (without straps) *T*, are fixed as follows:—

L L L L L L L  
ST—T—T—T—T—T

*ST* are fixed at the entry, and *L*, *L*, &c., are lamps or groups of lamps.

The connections are such that, provided *S* be on, each lamp (or group) *L* may be lighted in turn by passing from switch to switch; the moving of any switch-knob lighting the group in front and extinguishing that behind. Thus light may be got at a group on either side of any switch *T*, but not on both sides. Consequently, never more than half the total number of lamps can be on; while generally, if work is proceeding at only one part of the vault, it is only necessary to have one lamp (or group) alight.

Work out the circuit.

12. The large size "Twinob" switch, with the strap connecting two of its terminals cut away, is very suitable for controlling two lamps (or two groups of lamps) fed from different distribution boards.

For example, on a battleship with two separate generating and distributing systems, switch-points arranged as above-described enable light at any given place to be drawn from either or both systems when working, or from one only if the other be disabled.

Sketch the connections of two such switch-points to their lamps and distribution boards, assuming the ship to be "double-wired."

If the ship be "single-wired," show (a) that the "Twinob" switch does not require the above-mentioned alteration, and (b) that a two-way-off switch may be

substituted if it is never required to have both lamps (or groups) on at the same time.

N.B.—Samples of any of the switches, &c., referred to can be supplied to competitors at the average rate of 2s. 6d. each. Requests for samples must be accompanied by remittances, and

must be sent direct to A. P. Lundberg and Sons, Switch Specialists, 477-489 Liverpool Road, London, N. The money will be returned when the samples are sent back in good condition. Mention Competition when ordering. The above is an outside price as regards most switches, and a considerable reduction can generally be made when competitors desire to retain the switches.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### ILLUMINATION OF BUSINESS PREMISES

A BROCHURE full of instructive information, entitled "Scientific Illumination—Its Aid to Business," has been compiled by the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.).

In this little work the illuminating engineer has endeavoured to lay before the shopkeeper some arguments and information in a concise form—how essential it is to light his premises on correct lines if he desires to attract customers. The first points to consider in a modern installation are the lay-out of the premises, the class of trade carried on, and the nature of the goods to be displayed. Illumination is measured in



SHOP WINDOWS LIGHTED ON G.E.C. "DALITE" SYSTEM.

foot-candles; it is the business of the illuminating engineer to know how many foot-candles are required to suffuse with light the whole of the premises with its fittings and goods to be displayed. This is done by simple photometric instruments, by which an accurate measurement is obtained for a complete and perfect illumination. The booklet gives a number of illustrations of business premises illuminated by the G.E.C. "Dalite" system, amongst them being Peter Robinson, Ltd., Regent Street, London; and Harrods, Ltd., Brompton Road, London. These will serve as good examples of the methods advocated. The fine effect obtained is shown in the illustration.

### ELECTRIC LIGHT FITTINGS

THE General Electric Co. have also issued a new edition of their "Electric Light Fixtures" Catalogue. Over a hundred pages of new fixtures have been added, and many new designs appear on those pages which in the past were devoted to such accessories as glassware, silk shades, signs, ship fittings, shop lanterns, street lanterns, and posts, which have been eliminated and now appear in separate catalogues. The new edition contains so many new features that it is only possible to call attention to the most important. The pendant section now includes an extensive range of indirect and semi-indirect lighting on what the G.E.C. have named the "Dalite" system of illumination, and a large variety of reflector-bowl and sphere fittings. Many of the fittings in these classes employ "Superlux," "Equiluxo," "Perlux," or "Holophane" glassware, thus ensuring a maximum of efficiency and artistic effect; in other words, the best light and the most of it.

The bracket section includes many new designs based on inverted lights in shades or bowls, a charming example of which is illustrated in Fig. 1. The ceiling fixture and electro-

lier sections contain a number of new fittings based upon a centre light in bowl or sphere, surrounded by a number of smaller units in globes or shades. Many new and original table standards have also been introduced in some adapted Chinese vases such as that illustrated in Fig. 2, which are becoming very popular. There is at the end of the catalogue



FIG. 1.—BRACKET WITH EQUILUXO BOWL FOR SEMI-INDIRECT LIGHTING.

a section devoted to crystal fixtures reminiscent of the Bourbon period. The designs are thoroughly representative and are specially suitable for apartments such as halls, dancing rooms, reception rooms, &c., where illumination is essentially an enrichment of the general decorative scheme



FIG. 2.—CHINESE VASE TABLE STANDARD.

in certain periods. The whole catalogue is extremely well arranged, and the strict sequence of the catalogue numbers is a great convenience. It is interesting to note that, although this catalogue was printed and nearly ready for distribution before the war, it is not subject to any advance in price.



### A DOOR HEATER

A NOVELTY that should be of considerable use has been brought out by the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex, and 123 and 125 Queen Victoria Street, E.C.), in the shape of an electric heater to be attached to the bottom of a door to warm the air

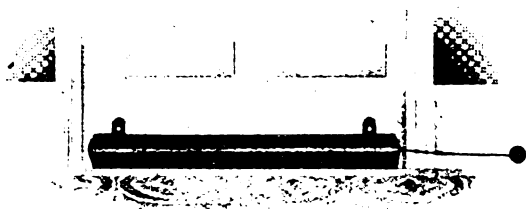


FIG. 1.—EDISWAN DOOR HEATER.

coming in under the door, and thus to avoid cold draughts. This should find application in offices, hotels, railway carriages and ships' saloons, as well as in private houses.

The illustrations show how the heater is fixed to the lower part of the door, either inside or outside the room.

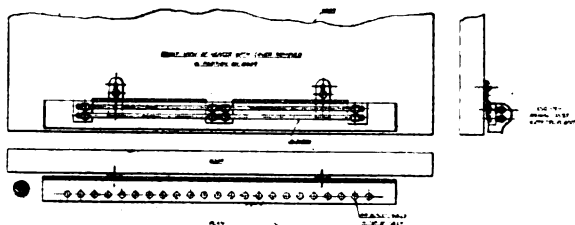


FIG. 2.—GENERAL ARRANGEMENT OF HEATER.

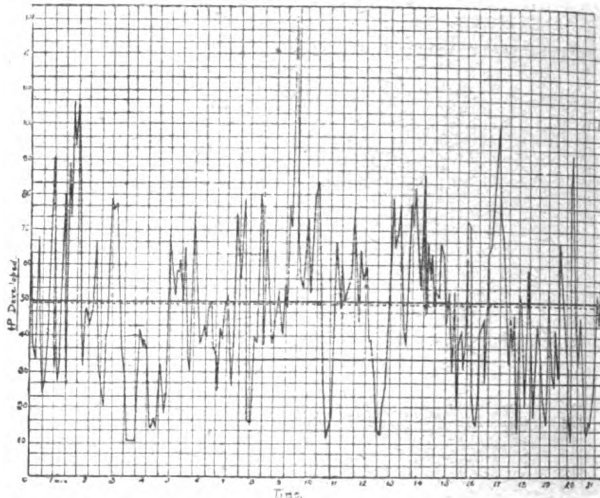
It consists of a radiator parallel to the lower edge of the door, with a flexible wire lead running to a plug on the wainscoting. An automatic switch can be provided to cut off the current when the door is opened. Four "Quartzalite" heating elements are used, each taking 125 watts. The standard measurement is 2 ft. 1 in. overall in length, but modifications to suit special requirements may be had on demand.

### NEW B.T.H. HIGH TENSION SWITCHGEAR

SOME newly-issued descriptive lists from the British Thomson-Houston Co., Ltd. (Rugby), give particulars of some interesting lines of high-tension switchgear developed by the Company. For mining and the rougher style of industrial work, where compact totally-enclosed dust-proof and drip-proof gear is required, a simple and robust type of ironclad "draw-out" gear has been designed in which the oil-switch, instruments (where mounted with the oil-switch), and automatic features are arranged on a sliding carriage and connected to the 'bus-bars or cables through plug contacts. The handles are so interlocked that it is impossible to withdraw or close the isolating contacts unless the switch is in the off position. When the carriage is withdrawn, all the essential pieces of apparatus may be freely examined. The carriages slide on rails, and the gear is so mounted on pedestals that the units can easily be assembled into complete switchboards with enclosed 'bus-bars. The draw-out principle is employed on a larger scale in the ironclad truck pattern of H.T. switchgear, where each complete panel with a flat iron front is carried on a wheeled framework and can be withdrawn bodily from its cubicle like a book from a book-case. This forms an ideal pattern of sub-station gear, and these truck panels are standardised to meet a considerable range of requirements for circuits up to 6,600 volts. Another new list deals with six different varieties of current transformers. Those for the higher voltages, both in the single and multi-turn patterns, all have porcelain tubes between the primary and the secondary. In some cases they are unenclosed, in some cases enclosed in compound, and again another form is oil-insulated. The straight-through patterns are either arranged for slipping the cable through the porcelain tube, or with a fixed copper rod primary.

### AN EXACTING TASK

THE accompanying load curve was voluntarily supplied to the General Electric Co., Ltd. (87 Queen Victoria Street, E.C.), by a large firm whose factories the G.E.C. have equipped electrically. It offers convincing evidence of the remarkable strain which a motor was called upon to withstand. The motor was rated at 50 h.p. at 200 r.p.m., and was driving a pair of heavy crushers. The firm's engineers noticed that at times the motor ammeter needle

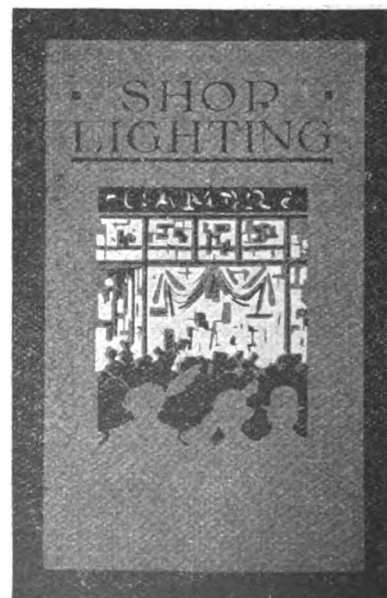


LOAD CURVE OF 50 H.P. WITTON MOTOR DRIVING HEAVY CRUSHERS.

swung off the scale, and it was decided to ascertain the extent of the peaks. The result of the investigation is given in the curve. The readings were taken at intervals of five seconds, on moving coil instruments, and it will be seen that overloads of 160 per cent. were attained. The purchaser reported that, during this time, the commutation of the motor was beyond reproach, and, although the average load was above the rating of the motor, it showed no tendency to overheat.

### SHOP LIGHTING

IN our last issue we made reference to a booklet on shop lighting, issued by the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), and we reproduced some of the illustrations therefrom, including



examples of both direct and indirect lighting, and showing how great a degree of success has rewarded the work of their illuminating engineers' department. It is also worth while to reproduce the cover design which, executed in blue in the original, is worthy of the contents of the booklet.

## CORRESPONDENCE

SWITCHGEAR CONSTRUCTION COMPANY,  
LIMITED.

To the Editor of ELECTRICAL ENGINEERING.

SIR:—Our notice has been called to the title of the above-mentioned new Company which we understand has recently been formed to take over the Switchgear business of the Union Electric Co., Ltd., and which is now in occupation of Works used until recently by Messrs. Voigt & Haefner (England), Limited. As we consider the title in question so closely resembles that of our Company as to be likely to cause confusion, we beg to inform you that we are in no way connected with the above-mentioned Company, nor, in fact, with any other Company or business concern. We have decided to circularise this letter as the only means of protecting ourselves, since there appears to be no remedy at law enabling us to restrain the Company in question from using the word "Switchgear" as part of its title. Our own title, "Switchgear & Cowans, Limited," was adopted with the object of retaining the identity of "The Switchgear Company, Limited," and "Cowans, Limited," when in 1911 we acquired and amalgamated those two old-established Companies for the purpose of continuing the business of manufacturing electrical switchgear.

Yours faithfully,

SWITCHGEAR & COWANS, LTD.

Springfield Lane, Salford, Manchester,  
28th Nov., 1914.

## APPOINTMENTS AND PERSONAL NOTES

Prof. Eric Gerard, of Liège, has been elected an hon. member of the Institution of Electrical Engineers.

Mr. Walter J. Cridge, for some years past resident in Birmingham, has joined the Queen's Westminster Rifles.

The Northampton Tramways Committee recommend that Mr. J. C. Cameron, the Tramways Electrical Engineer, be appointed Manager for six months to succeed Mr. Gottschalk. The latter, it will be remembered, was recently removed from his position owing to his German birth.

Switchboard attendants are required at Watford and Swindon. (See advertisement on another page.)

Resident engineers, switchboard attendants, shift engineers, &c., are wanted. Particulars are given in our advertising columns.

## EVERY INSTALLATION ENGINEER

Should join his Trade Protection Organisation,  
THE

## ELECTRICAL CONTRACTORS' ASSOCIATION

(Incorporated).

Inquiries cordially invited by the Secretary,

L. G. TATE,

20, Bucklersbury, LONDON, E.C.



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TENDERS INVITED AND  
PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Australia.**—The Victorian Government Railways require ten miles of paper-insulated, lead-covered telephone cable. Tenders by Dec. 28th. Further particulars at 78 Basinghall Street, E.C.

The Melbourne City Council requires 6,740 yds. of single-conductor lead-covered copper cable. Specification from Messrs. McIlwraith, McEacharn & Co., Billiter Square Buildings, London, E.C., to whom tenders by Dec. 9th.

**Ireland.**—The Great Northern Rly. Co. (Ireland) require for their Dundalk works electric motors, sub-station switchboard, copper wire, and bitumen wires. Secretary, Dec. 21st. (See an advertisement on another page.)

**London:** L.C.C.—Two 8,000-kw. turbo-generators, with auto-transformers. Dec. 22nd. (See an advertisement on another page.)

**Islington.**—A loan of £4,975 is recommended by the Finance Committee of the L.C.C. for mains, transformers, services, and meters.

**H.M. Office of Works.**—Twelve months' supply of cable and wire from Jan. 1st, 1915. Dec. 7th.

**Manchester.**—Further borrowing powers, amounting to £543,000, are required in connection with the new Barton power-station.

**Oldham.**—An inquiry has been held concerning a loan of £40,000 for electrical extensions.

**Redditch.**—As reported in our columns, a reconstruction scheme at the electricity works, costing £18,000, was decided upon some time ago. Since then, the Birmingham Small Arms Co. has applied for a supply of about 2,000,000 units per annum. Terms have been arranged, and an additional loan of £10,000 is to be applied for.

**Slaitwaite.**—The Yorkshire Electric Power Co. has quoted the Council terms upon which they will be prepared to supply electricity in bulk. It is suggested that a twenty-one years' agreement be entered into with provision for revising the rates at seven and fourteen years respectively. The Company also mentions that, owing to the national crisis, it is not disposed to incur capital expenditure unless absolutely necessary, and suggests that the Council might co-operate by advancing the capital necessary for the mains extensions, the Company repaying by annual instalments with interest during the period of agreement. Mr. J. Schofield has been retained as consulting engineer.

**Stoke-on-Trent.**—A Local Government Board inquiry was held last week concerning a loan of £44,000 for the Electricity Undertaking.

**Tunbridge Wells.**—Two water-tube boilers, with mechanical stokers, economisers, super-heaters, and induced-draught plant are to be installed. Borough Electrical Engineer.

## Wiring

**Fife.**—Electric lighting and telephones, Glen Lomond sanatorium. Architect, A. C. Dewar Leven.

**Glasgow.**—Lighting, telephones, bells, and fire alarms at Robbroyston Hospital. City Electrical Engineer. Dec. 12th.

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Birmingham.**—Public baths, Sattley.

**Chesterfield.**—Cinematograph theatre, Burlington Street.

**London.**—Reconstruction North-Eastern Hospital. Metropolitan Asylums Board.

**Lowestoft.**—New factory for Messrs. Macdonochie Bros.

**Norwich.**—Extensions to infirmary.

**Nottingham.**—Concert hall, Trent Bridge. Town Clerk.

New building, Notts Co-operative Society (£25,000).

**Penrith.**—Electric lighting of Guardians' premises.

**Rochdale.**—New school. Town Clerk.

**Sheffield.**—New School Medical Department, Sims Street; alterations and extensions at Manor School. City Architect.

## Miscellaneous

**Colchester.**—Three months' supply of electrical goods, from Jan. 1st, 1915, for Severalls Asylum. Clerk, Dec. 10th.

**Edinburgh.**—An electric motor lorry is to be purchased at a cost not exceeding £700.

**London: Port of London Authority.**—Twelve months' supply of arc-lamp carbons. Secretary, Dec. 8th. (See an advertisement on another page.)

### TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**France.**—The Electrical Engineering & Equipment Co. is executing contracts for several thousand miles of telephone cable for the French Government.

**Leeds.**—Some dissatisfaction is being expressed in Leeds owing to the fact that the Corporation has placed an order with Messrs. Escher Wyss & Co., of Zurich, for a 12,000-kw. turbine for the electricity works. Although Messrs. Escher Wyss & Co. are a Swiss firm, the *Leeds Mercury* contends that it is in reality German controlled owing to the connection of the Allgemeine Elektrizitäts Gesellschaft, of Berlin, with the Electro-Bank of Zurich, which is largely interested in the Escher Wyss undertaking. We have communicated with the London representative of Messrs. Escher Wyss & Co., and understand that two-thirds of the Company's capital is held in Switzerland by Swiss interests, and that the A.E.G. has no control whatever.

**London: Hammersmith.**—The following tenders have been received for the supply of high- and low-tension cables of the following sizes:—High-tension, 0'1 and 0'05; low-tension, 0'2, 0'15, 0'1, 0'025, and 7/22 twin: Western Electric Co., £432 10s.; British Insulated & Helsby Cables, Ltd., £440; Callender's Cable & Construction Co., £442 12s.; W. T. Henley's Telegraph Works Co., £442 14s.; Johnson & Phillips, £447 14s.; Siemens Bros. & Co., £453 15s.; Macintosh Cable Co., £454 15s.; and W. T. Glover & Co., £456 13s. The tender of the Macintosh Cable Co. is a firm offer for three months, and it is recommended for acceptance.

**Pontypridd.**—The Council recently advertised for 1,800 yds. of 0'4 sq. in. cable. It was found, however, that none of the English firms were able to undertake to deliver under twelve weeks. As this would be no use for the winter load, it was decided not to put down the new feeder until next summer, but to complete the plating of the sub-station battery instead, the contract for which is in the hands of the Tudor Co.

**Tunbridge Wells.**—The tender of the Western Electric Co. has been accepted for the supply of cables for three years.

**Walsall.**—The Tramways Department has accepted the tender of Siemens Bros. Dynamo Works for a supply of Tantalum lamps.

A curious condition of things was revealed recently in connection with tenders received by a certain Electricity Committee. A firm, thought to be of foreign origin, was asked as to its constitution. They replied that the whole of the capital was held by Germans, the whole of the Board of Directors were German, with the exception of the Managing Director, all the employees were British born, the materials were bought in the open London market, and that a number of their employees had enlisted, and that the Company had decided to pay their dependents during the war.

### MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. G. Smith & Son inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £58 10s. to £59. (Last week, £58 5s. to £58 15s.)

**Bankruptcy.**—The last day for receiving proofs in the bankruptcy of J. Swainson, Electrical Contractor, 22 Booth Street, Manchester, is Dec. 8th. The trustee is A. Yearsley, 27 Brazenose Street, Manchester.

**Liquidation.**—The statement of accounts in the liquidation of the Leitner Electrical Co. shows liabilities amounting to £31,566 and assets £11,301. The deficiency as regards contributories is £42,263. The Company erected works at Moscow

in 1912 and did a considerable amount of work with the Russian Government. These works, however, are to be closed as the liabilities do not justify their continuance, notwithstanding the amounts due to the Company.

**Canadian Agency.**—An agent in Ontario desires to secure agencies of United Kingdom makers of electric lighting fittings, shades, &c. Further particulars at 73 Basinghall Street, E.C.

### COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Electric Construction Co.**—An interim dividend at the rate of 7 per cent. is to be paid on the preference shares for the half year to Sept. 30th.

**Chloride Electrical Storage Co.**—The directors have decided not to pay an interim dividend on the ordinary shares this year owing to the uncertainty brought about by the war.

### LOCAL NOTES

**Belfast: Administration of Electricity Department.**—Four reports from members of a Special Committee have been prepared, dealing with certain charges made as to the administration of the Electricity Department. They will be considered at a special meeting of the Corporation.

**Manchester: New Power Station.**—It is anticipated that there will be a loss on the Barton power scheme in the year ending March 31st, 1917, of £10,278.

**Mayo: Electric Lighting Loan Refused.**—The Irish Commissioner of Works has refused to sanction a loan for the electric lighting of the Castlebar District Asylum on the ground that it is not an urgent matter, the Treasury having decided not to grant loans in the present crisis except for urgent purposes.

**Peterborough: Street Lighting Tests.**—Tests of experimental metal-filament electric lamps and gas lamps for street lighting, made by Messrs. Alexander Wright & Co., show that the electric lamps gave an average candle-power of 56'86, and the gas lamps 38'88. The electric lamps cost £3 per lamp per annum, and the gas lamps £2 14s., and thus the comparative prices per candle-power per annum work out to 12'7d. for electricity and 16'67d. for gas.

**Portrush: Electrical Installation.**—After deciding to proceed with the electric lighting scheme in accordance with the Order of 1913, the Council has come to the conclusion that the work should be deferred for the present.

**Slaithwaite: Consulting Engineers' Etiquette.**—Mr. A. B. Mountain, Borough Electrical Engineer at Huddersfield, has refused to submit terms in competition with other consulting engineers for giving professional advice to the Council as to an electric lighting scheme. Mr. Mountain informed the Council that this would be contrary to the rules of the Institution of Electrical Engineers.

**Wolverhampton: Electric Vehicles.**—A Paper on electric road transport was read recently before the Engineering Society by Mr. W. E. Warrilow, who pointed out the impetus that had been given to this class of traction by the impressing of petrol vehicles by the War Office and urged the claims of electric omnibuses to link up outlying districts not served by tramways. Mr. S. T. Allen, Borough Electrical Engineer, was in the Chair.

**Yorkshire: Power Co.'s Bill.**—Last year the Yorkshire Electric Power Co. promoted a Bill to enable it to supply electricity in detail in districts where electric lighting powers had not already been granted. Owing to a technical error in the notices, the Bill was not allowed to proceed, but the Company is renewing its application next session.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

NO. 415 [VOL. X., No. 50]

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THURSDAY, DECEMBER 10, 1914.

[PRICE ONE PENNY.]

*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

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Telegrams: "Circling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

THE testing of power plant with particular reference to boilers and turbo-generators was dealt with in a paper by Mr. W. M. Selvey discussed at last Thursday's meeting of the Institution of Electrical Engineers (p. 628).

SOME particulars are given of the electrically-worked lock gates at Zeebrugge, which were put out of action by the naval bombardment (p. 629).

THE order for a new 5,000 kw. turbo-alternator just put into operation at the Salford Electricity Works was sanctioned by the Electricity Committee ten days after Mr. J. A. Robertson, their new engineer, took up his duties, and the machine was supplied and erected by the British Westinghouse Company in nineteen weeks (p. 629).

COMPLAINT is made at the want of uniformity in the enforcement of the police regulations regarding street and shop lighting during the war. It is suggested that maximum figures of illumination in foot-candles for the two purposes should be specified and that members of the Illuminating Engineering Society should assist the police to enforce them. Mr. Frank Bailey has had trouble due to moisture and condensation in those arc lamps which are not in use, and has to light them in the daytime to dry them out (p. 629).

AMONG the subjects of specifications published at the Patent Office last Thursday are sterilisation of water, welded contacts, car lighting dynamos, and fuses. A patent for the manufacture of insulators has been granted in spite of opposition (p. 630).

THE earthing of lightning conductors is dealt with in our "Questions and Answers" columns (p. 630).

THE action by the Ilford Gas Co. against the Ilford Urban District Council for alleged undue preference in its systems of charging, and also with regard to hiring out apparatus without powers, has been postponed until the next sittings of the Law Courts (p. 631).

IT has been found that the heat developed by 55-watt lamps used as pendants with ordinary shades is sufficient to weaken the insulation of the "flex" at the cord-grip, and also that there may be a similar result in the cases of electric irons, hot plates, &c. (p. 632).

TESTS have been made at the National Physical Laboratory of the carrying capacity of lampholders (p. 632).

SOME further information has reached us with regard to the effect of the war on the electrical industry in Germany (p. 632).

A "WIRELESS SPY" has been sentenced to three months' imprisonment, and another case is proceeding by court martial. Semi-automatic working has been adopted in telephone exchanges at Zürich (p. 632).

REFERENCE is made in "Electric Traction Notes" to the Post Office tube railway and the use of electric cars in America and on the Continent (p. 632).

OUR trade section contains articles describing an electric grinder, an engine revolution indicator, a water-tight lampholder, a new fuse, some combined lampholders and reflectors, and a compact design of switch-board (pp. 633-635).

A 1,000 kw. turbo-alternator is required at Dover; further plant is to be installed at Birmingham; Blackpool (£25,000); Colwyn Bay (£35,000); Coventry (£55,987); Torquay (£15,860); and Turton (£3,560) (p. 635).

DIFFICULTIES are being encountered at Eastbourne through shortness of staff owing to the war.—London borough councils owning electricity works are advised to present individual petitions against the L.C.C. Power Bill. Opposition is also to be offered by West Ham (p. 636).

WE give some particulars of the working of the A.E.G. (Berlin) for the year to June 30th (p. 636).

**Steam Consumption Tests of a Ljungström Turbine.**—In ELECTRICAL ENGINEERING of Oct. 29th, p. 561, we gave some results of steam consumption tests of the 1,000-kw. Ljungström turbo-alternator which has been installed at the St. Pancras Electricity Works. The figures realised, in lbs. of steam per kw.-hr., were 12.75 at full load, 13.57 at three-quarter load, 14.67 at half load, and 17.76 at quarter load. It is of interest to add that the conditions to which these figures refer were as follows:—Vacuum, 28 in.; steam pressure at stop-valve, 185 lb. per sq. in.; superheat, 200° F.

(For arrangements for the week see p. 631.)



## POWER PLANT TESTING

A PAPER on this subject by Mr. W. M. Selvey was discussed at the London meeting of the Institution of Electrical Engineers on Nov. 26th, and will engage the attention of several of the Local Sections. In his introductory remarks, the author made a strong case for the devotion of care and expense to the accurate testing of generating plant, in connection with which the importance of high efficiency was already recognised in the bonus and penalty clause which had become a regular feature of power-plant purchase. Considering first the boiler-house, he showed how the percentage of  $\text{CO}_2$  in the flue gases was an indication of the excess air present and how the efficiency obtainable was expressed in terms of the  $\text{CO}_2$  and the final temperature. The ideal percentage of  $\text{CO}_2$  varied considerably with different classes of coal, but in most English coals was 18 to 19 per cent. He had used the Orsat apparatus for these determinations with an arrangement of aspirator bottles drawing gases from sampling tubes in the flues. For the high temperatures he had used copper-constantan couples supplied by the Cambridge Scientific Instrument Co., Ltd., and checked at the N.P.L. Radiation losses should be not more than 3 per cent. in a 20,000 lb. boiler or 2 per cent. in a 30,000 lb. boiler, and the loss by unburnt fuel could be taken as another 2 per cent. A great deal depended on the suitability of the design of the furnace to the particular class of coal. It is comparatively easy, he continued, to produce an amount of  $\text{CO}_2$  ranging from 12 per cent. to 14 per cent. on a chain grate with a long arch when the duff is not above 30 to 40 per cent; but when this rises above 60 per cent. it is difficult to keep the  $\text{CO}_2$  up to 8 or 9 per cent. To sum up, an average of 10 per cent. would be exceedingly good working. This refers to the gases at the boiler exit. The amount at the economiser exit is often 2 per cent. lower. The size of the economiser has a large effect on the final temperature. The temperatures on full load should taken, say, twenty-four hours after sweeping, and should be used as a standard. If at any subsequent time the boiler exit temperature is found to be  $150^\circ\text{F}$ . higher, or the economiser outlet to be  $100^\circ\text{F}$ . higher, the boiler needs cleaning. Values of  $600^\circ\text{F}$ . for the former and  $350^\circ\text{F}$ . for the latter may be considered satisfactory. The author thought that many engineers were unaware of the average amount of  $\text{CO}_2$  in their boiler houses, and he would be surprised to find if, when taken over the twenty-four hours, it was in many cases anything like as high as 6 per cent.

The use of the Whipple indicator and modern forms of thermometer had enabled an accuracy of nearly 1 per cent. to be reached in turbine testing; highly reliable steam-test gauges were also obtainable. A more difficult measurement was the vacuum at the exhaust flanges, and here an aneroid barometer was preferable to a mercury column. The measurement of condensed matter offered little difficulty, thanks to the manufacturers of weigh-bridges, the accuracy of which was better than 0.1 per cent. With regard to electrical measurement of output, it was better, except for rapidly varying loads, to take precision ammeter and voltmeter readings, rather than trust to watt-hour meters, on account of their temperature errors, and all instruments should be checked where possible *in situ*. Speaking of alternating-current instruments, the author expressed the opinion that the only satisfactory method is to take complete the whole set of pressure transformers, current transformers, leads, and meters, to the National Physical Laboratory—or, say, the Manchester University—before a test, have them thoroughly checked, and then tally every lead on breaking circuit. All the gear should then be brought by hand to the user. The meters should be mounted in a remote-control room quite cool and free from vibration, the length and section of the leads having been pre-arranged to allow for this. With some forms of switchgear, he continued, it is only possible to take the maker's word for the ratio of the transformers, if the testing is to be done "on the system," which it always should be, if possible. The meters alone are then checked. This may give fairly satisfactory results in the hands of an expert if the meters are run on unity power-factor. Efficiency tests should always be run on unity power-factor unless there are serious reasons for the contrary.

The author then dealt generally with air-pumps, and expressed the view that the ultimate type of pump would probably be a steam augments jet in series with a rotary pump of the Kinetic or Leblanc type. In rating air-pumps, provision should be made for 1 to 1.5 lb. of air per 1,000 lb. of steam. The air leakage could be estimated by the Scanes gauge, and it was usual in testing the capacity of air-pumps to disconnect them from the condenser and to admit various

amounts of air measured by the in-draught through calibrated nozzles.

Regarding the testing of cooling-towers, great care should be taken in reading dry and wet bulb temperatures; even radiation from the observer's face is apt to vitiate a reading. After a few remarks on the testing of centrifugal pumps and fans, the author emphasised the importance of careful organisation and choosing of the *personnel*, taking all readings in triplicate, and recommended at least an hour's interval between tests at different loads. He thought that it was fair that turbine plant should run six months on commercial load before being tested, and that the contractor should be allowed forty-eight hours to open out and examine the machine in preparation for the test.

The discussion was opened by Mr. R. A. Chattock (City Electrical Engineer, Birmingham), who said that there was sometimes difficulty in finding the trained observers necessary for accurate tests, especially in small stations. Independent observers were therefore advisable to check the contractors' measurements. Testing was useless unless the test conditions were clearly defined in the specification. There was too much diversity in this respect, and he suggested that the Engineering Standards Committee might take up the question. The testing equipment required might also be standardised.

Mr. C. C. Paterson (National Physical Laboratory), in dealing with the electrical side of the tests, said that an overall accuracy of 1 per cent. meant electrical measurements within 0.1 or 0.2 per cent. This could only be accomplished, in the case of three-phase work with high currents and voltages, by taking great precautions. The two important points were the constancy of the instruments between calibration and testing and the absolute accuracy of the calibration. Modern induction instruments were very little affected by stray fields if certain precautions were taken, but the absolute calibration of three-phase instruments for, say, 1,000 amperes and 600 volts, in making comparisons with standard cells and mercury ohms, could not hope to be accurate unless the most scrupulous care was taken in the arrangements for changing over the circuits. Again, the ratio of current transformers should never be assumed, but the instruments should always be tested complete with their transformers. Three-phase meters should also never be tested on single-phase circuits. It was better to use three single-phase instruments if a three-phase circuit could not be used for testing. Errors had to be guarded against due to interchange of phase connections, but a convention as to this had already been standardised.

Mr. R. Hammond made some amusing remarks on the importance of the money guarantee of efficiency and the necessity of systematic procedure in informing the contractors of the conditions of tests, giving some details of his own procedure in this respect.

Mr. A. E. Scanes (British Westinghouse Co.) showed a slide illustrating his vacuum efficiency and absolute pressure gauge, and joined issue with the author regarding the relative advantage of the steam jet and rotary air pump, strongly defending pumps of the Leblanc class.

Mr. W. B. Woodhouse (Chief Engineer, Yorkshire Electric Power Co.) said that overall efficiency tests were apt to lead to discrepancies, especially in the boiler-house, unless great care was taken as to the assumptions made. It was absurd to base boiler efficiencies on calorimeter tests. In his opinion, the efficiencies of the fuel, the furnace, and the boiler proper should be ascertained separately.

After some remarks by a speaker on cooling tower design, Mr. H. Boot referred to the value of recording instruments in revealing the deterioration of plant, and remarked that the author had not dealt with the V-notch method of water measurement, which he had himself found to give results within  $\frac{1}{4}$  per cent. of the weighing tank system.

Mr. R. S. Whipple (Cambridge Scientific Instrument Co., Ltd.) made a few remarks in favour of electrical thermometers, which in the course of his reply Mr. Selvey characterised as excellent but too expensive.

**International Engineering Congress, 1915.**—A report having recently been circulated to the effect that the International Engineering Congress was to be abandoned, we are desired to state that this is not correct, but that the Congress will be held in San Francisco as intended, from September 20th to 25th, 1915. The Committee of Management is actively proceeding with arrangements, and is in receipt of a sufficient number of communications from various foreign countries throughout the world, including those within the war zone, to indicate that a large majority of the papers originally requested for presentation at the sessions of the Congress will be handed in. Detailed information will be sent upon application to the Secretary, Foxcroft Building, San Francisco, California.

**Royal Institution.**—The Eighty-ninth Christmas Course of Juvenile Lectures will be delivered by Professor C. V. Boys, F.R.S., on "Science in the Home," on Dec. 29th and 31st, and Jan. 5th, 7th, and 9th. The lectures on Jan. 5th will be particularly devoted to electricity in the home.

## ELECTRIC POWER AT ZEEBRUGGE

A REPORT has been published to the effect that one of the reasons that the bombardment of Zeebrugge by our Navy had rendered that place useless as a naval base to the Germans was that the electric power station had been destroyed, and this prevented the opening of the lock gates, so that several German submarines were imprisoned in the inner harbour. It is also reported that the Belgian electrical engineer has escaped to Sluis, and declined the Germans' pressing invitation to return in order to repair the damage.

As so much interest has been displayed in the matter, our readers may like to know some details of the electrical method of working the lock gates. The gates at Zeebrugge are unlike the hinged dock gates more usual in this country; they are of the rolling type, running on rails and disappearing into recesses in the side walls. Each is 67 ft. wide at the bottom and 80 ft. wide at the top, and is carried on two pairs of axles. The total weight of each gate is 200 tons, and they are drawn aside by an arrangement of chains by a winch, driven by a 20-h.p. electric motor. Hand gear is also provided, however, by means of which the gates can be opened or closed by three men in fifteen minutes. Presumably this gear was also put out of action by our shells.

The gates had been working since 1900, having been used by the contractors for some time before the rest of the harbour works had been completed. There was also a very large electric Titan crane, and two electrically-worked swing bridges spanned the lock. All this plant was worked from an electric power station adjoining the lock, which also supplied the local lighting. This was equipped with four water-tube boilers of a Belgian make and two sets of Willans 200-h.p. engines driving continuous-current dynamos, each rated at 350 amperes at 440 volts. The Bruges ship canal, of which this lock is the outlet has a course of  $7\frac{1}{2}$  miles in a straight line, and is 230 ft. wide at the water-line.

It will be seen that Zeebrugge thus formed an excellent base for the assembling and launching of submarines brought by rail.

## QUICK WORK AT SALFORD

TEN days after Mr. J. A. Robertson entered upon his new duties as Borough Electrical Engineer at Salford, the Electricity Committee endorsed his recommendation to accept a tender by the British Westinghouse Co. to supply and erect a 5,000-kw. Westinghouse-Rateau turbo-generator at the electricity works without delay. By suspending Standing Orders, the acceptance of the tender by the Council was speedily effected, and within nineteen weeks of the date of the order the machine was erected and running.

On Mr. Robertson's arrival last May, the generating plant at the works consisted of seven 800-kw. Browett-Lindley vertical engines coupled to Mather & Platt D.C. dynamos, and three 1,000-kw. D.C. turbo sets (two Willans-Siemens and one Willans-Brown Boveri). These sets supplied direct to a low-tension network, including tramways. In addition, power was being brought "in bulk" from the Lancashire Electric Power Co., a three years' contract for 8,000 kw. having been entered into in 1913. This power is supplied at extra high pressure at the boundary of the Lancashire Power Co.'s area and the Borough of Salford, whence an E.H.T. cable leads it to the electricity works, and there it is converted for connection to the D.C. network by static transformers and three 1,000-kw. General Electric rotaries.

As there is no supply of water for condensing purposes at the power house, and cooling towers have to be used, it has yet to be decided whether it will not be expedient to build a new station altogether on another site; but meantime Mr. Robertson decided on the course of putting in a modern 5,000-kw. set, so as to save steam, for the old reciprocating sets are, of course, very uneconomical compared with present-day practice. There is sufficient boiler plant to meet requirements. The new set generates at 6,600 volts, three-phase 50 cycles (1,500 r.p.m.), and to convert to D.C. two Westinghouse 750-kw. rotaries with Westinghouse static transformers (originally destined for a sub-station the buildings for which are not yet completed) have been put down at the works, and the three 1,000-kw. rotaries now used with the Lancashire Power Co.'s bulk supply will also be available. One of the reasons for urgency in getting down the new set was, we believe, that the Power Co.'s supply has been interrupted on one or two occasions. Other sub-stations are also being erected in various positions in the area, and new E.H.T. mains are to be laid and some of the old L.T. mains pulled out. It is not probable that the present contract with the Lancashire Electric Power Co. will be renewed on

expiry, but the main will doubtless be left in as an emergency link between the stations.

Another 5,000-kw. turbo-alternator is on order, to be ready for the winter 1915-16—a Willans (Zoelly)-Westinghouse, the electrical part of which will be an exact duplicate of the present machine. To make room for the latter, one of the reciprocating sets was taken out, and for the second 5,000-kw. set two of these old machines will be replaced.

There was an inaugural ceremony at the works on Wednesday last week, when both Mr. Robertson and the contractors were deservedly complimented on the success of their rapid work. Excellent speeches were made by the Mayor of Salford, the Chairman of the Electricity Committee (Councillor Billington), Mr. Robertson, and others. The speakers were rightly impressed by the contrast in the physical dimensions of the new machine and the old ones compared with their output, and the comparison was well illustrated, as the long line of six large reciprocating sets had almost exactly the same capacity as the compact new set, which was far smaller than one of the six old ones. Moreover, Councillor Billington pointed out that the cost of the old sets had been £14 per kw. against £3 per kw. for the newcomer, which, it was said, consumed  $14\frac{1}{2}$  lb. per kw.-hour as against double the consumption of the old. These figures, needless to say, must be taken as very rough; doubtless something more precise with statements of load, vacuum, and superheat will be available when the reception tests have been taken. Mr. Robertson, after paying a tribute to his staff, whose loyal and energetic co-operation, he said, really deserved the credit given to him, spoke of the field for future development in Salford. At Greenock, whence he had just come, they sold 136 units per annum per head of population, but in Salford so far only 42. There was a large load to be got in Salford, however, with a good diversity factor, and he was hopeful for the prosperity of the undertaking.

## LONDON'S REDUCED LIGHTING

THE reduction in the lighting of the streets of London, and also in the amount allowed in shop-windows, was the subject of a discussion at the Illuminating Engineering Society on Dec. 1st. Mr. L. Gaster, the hon. secretary, complained of the lack of uniformity in the enforcement of the regulations issued by the police. It was suggested that the Council of the Society should make representations to the Home Office on this matter. Mr. Frank Bailey, Chief Engineer to the City of London Electric Lighting Co., gave some interesting particulars of the way the problem has been tackled so far as street lighting is concerned in the City. There the authorities were given definite instructions that the street lamps must not be allowed to illuminate the sides of buildings for more than 6 ft. from the ground. These instructions came at 11.30 in the morning, and all the arrangements were made by lighting-up time the same day. A difficulty arose, however, with regard to dealing with fogs if, as was suggested, the globes of all lamps were to be partly obscured. It was therefore agreed with the City Corporation to leave every alternate lamp clear, but not to light it. This was found, however, to give rise to difficulties due to condensation, rain, &c., and a series of faults developed on these particular lamps through being out of use. The only alternative, therefore, was to dry them out by running them in the daytime, for which, added Mr. Bailey, he had been somewhat severely condemned by those who did not know the circumstances, for wasting current. It is interesting to note that so effective has been the reduction in the lighting in the City of London that officials of the Corporation have been unable, from the dome of St. Paul's, to locate certain points at midnight. A suggestion was made during the discussion that the authorities should lay down a maximum illumination for street lamps and for reflection on the pavements from shop-windows, and that members of the Society should offer themselves to the local police to carry out measurements to see that the regulations are being adhered to. Instances were noted of 16 ft.-candles from a street lamp a few yards away from a shop, the owner of which was summoned for allowing  $1\frac{1}{2}$  ft.-candles upon the pavement outside his shop-window. Among the advantages which the present restricted lighting has conferred would seem to be that for railway goods yards lighting, considerably less illumination than has hitherto been found possible, and particularly has this been the case at the Nine Elms depot of the London & South Western Railway Co. There was a general feeling that when the order for "lights up" is given we should not immediately plunge back to the old lighting, but that experiments should be made with a view to determining to what extent this can be reduced without impairing efficiency. There would seem to be a good many interested in illumination who have come to the view so often expressed by Mr. A. P. Trotter, that the tendency, prior to the war, was towards too brilliant artificial illumination. Mr. F. W. Willcox, of the British Thomson-Houston Co., emphasised the need for scientific shop lighting, pointing out that those firms who had taken expert advice had found themselves much less inconvenienced in the present crisis than shops in which cruder forms of lighting still prevail.

## "ELECTRICAL ENGINEERING" PATENT RECORD

*(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)*

### Specifications Published Dec. 3rd, 1914

A full list of electrical patents published last week appeared in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

25,503/13. **Sterilisation of Water.** E. L. JOSEPH. Apparatus for sterilising water by ozone, in which the water is forced by a specially designed pump in the form of spray into the space where the ozonised air is admitted, and falls into a settling tank, from near the top of which it is drawn off. (Two figures.)

26,582/13. **Welded Contacts.** WESTERN ELECTRIC CO. (Woodward for W.E. Co., U.S.A.). Machine for affixing contact points of platinum or other metal to switch parts by electric welding. The contact material is fed in the form of wire through a hollow electrode plunger, which welds the point of the wire on to the switch part placed below it. The point is afterwards automatically severed from the wire. (Thirteen figures.)

390/14. **Car-lighting Dynamos.** B.T.-H. Co. and A. A. POLLOCK. An approximately constant voltage is maintained over a considerable range of speed by means of additional field coils excited by the current flowing between an extra intermediate commutator brush and the mid-point of the battery. The extra brush is so placed that the auxiliary field assists the main field at low speeds, and weakens it at high speeds. (Two figures.)

2,301/14. **Fuses.** H. H. BERRY. This is a tubular cartridge fuse in which the internal fuse wire is easily replaced without any tools. The end of the wire is lightly twisted round a pin at the end, and a contact cap is screwed over it with a spring washer, making contact with the fuse wire. The ends of the outside of the tube have screw threads made of coiled wire which assist in making contact. (One figure.)

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.

Summaries of some of the more important of these Patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** HADLEY [Insulating material] 8,138/14.

**Electrometallurgy and Electrochemistry:** COUCH [Electrolytic cleaning] 23,454/13.

**Heating and Cooking:** BERRY [Ovens] 26,497/13; HEARSON [Control of temperature] 26,831/13.

**Instruments and Meters:** THORPE and THORPE METER SYNDICATE [Electrolytic meters, &c.] 18,869/13; B.T.-H. Co. and YOUNG [Induction meters] 28,826/13; COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES A GAZ [A.C. meters] 10,707/14.

**Switchgear, Fuses and Fittings:** TUCKER and CRABTREE [Switches] 23,444/13; ADAMSON [Switches] 25,915/13; GRIESBACH and VENNER TIME SWITCHES, LTD. [Time switches] 27,360/13; ELLISON [Controllers] 925/14.

**Telephony and Telegraphy:** PARSONS [Line selectors] 25,991/13; COMER [Music-transmitting apparatus] 26,077/13; BETULANDER [Automatic telephones] 9,840/14; SQUIER [Wireless receiving apparatus] 17,487/14.

**Traction:** BECK [Automatic control of trains] 25,636/13; ESTÈVE [Car lighting] 133/14.

**Miscellaneous:** A. W. PENROSE & Co. and OWEN [Lifts] 12,659/14.

The following Specifications are open to Inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Telephony:** ALSSON and ANOTHER [Pupin coils] 22,270/14.

**Switchgear:** BARNUM and ANOTHER [Switches] 22,435/14.

### Applications for Amendment

11,886/13. **Commutators.** C. ZENK. Application has been made to amend this specification by limitation of claims. It describes a method of commutator construction in which the end insulation is moulded out of the assembled segments *in situ*.

### Opposition to Grant of Patents

6,421/13 and 5,501/14. **Insulators.** W. L. DOULTON and P. MORRIS. Grants on these two specifications, which describe machinery for automatically shaping earthenware insulators, has been allowed, in spite of opposition.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** W. SCHMAHL [Junction boxes] 17,511 and 17,512/08.

**Electrochemistry and Electrometallurgy:** H. PAULING [Fixation of nitrogen] 18,435/06; C. GRÜNWARD [Electric furnaces] 7,396/09; P. BUNET and A. BADIN [Fixation of nitrogen] 16,224/09.

**Incandescent Lamps:** C. H. WEBER [Metal filaments] 18,808/09.

**Miscellaneous:** J. C. ETCHells [Lift control] 6,475/09.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,420.

What are the modern methods employed to protect consumers on the L.T. sides of transformers from accident due to high voltage?—"UNIT POLE."

*(Replies must be received not later than first post Thursday, Dec. 17th.)*

### ANSWERS TO No. 1,418.

A small building for storing explosives at a colliery is fitted with two lightning conductors, one at each end of the building. Each conductor terminates in a copper earth-plate, 2 ft. square, packed in coke, and the resistance between the two conductors through the earth was found to be 17 ohms. Is this a satisfactory value?

Discuss the earthing of lightning conductors, and say whether it would be an advantage to connect the two plates together with a copper bond.—"Tyneside."

The first award (10s.) is made to "S. C. J." for a reply given in slightly abbreviated form below:—

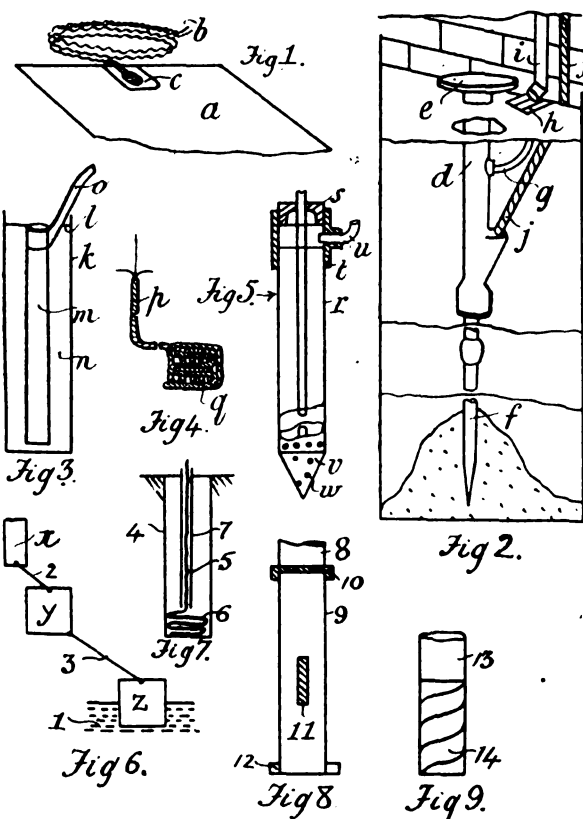
Seventeen ohms cannot be said to be a satisfactory value for the resistance between two lightning-conductor earths, especially at this time of the year. The resistance between the two earths should not be more than about 2 ohms, but it is doubtful if such a result can be obtained with plates less than 3 ft. square.

The earthing is a very important part of a lightning-conductor system, and the following points should be observed:—

The conductor leading to the earth plate, and the plate itself, should be of the same metal (preferably copper), or destructive galvanic action will occur at the joint. The joint should be made by means of rivets of the same metal, and should be protected, as far as possible, from moisture. An "earth" consisting of a spiral of copper tape wound on a wood frame with ends leading above ground forms a good "earth," and does away with underground joints. Joints, even above ground, should be avoided as far as possible. The plate should be buried at such a depth as to ensure its being surrounded by permanently moist soil, or arrangements should be made for water to drain into the soil about the earth plate. A quantity of coke or smith's ashes should be buried with the earth plate so as to surround it and help retain moisture. The former is the less satisfactory, because of the larger percentage of sulphur it contains, thus conducing to more rapid corrosion of the plate. In the case of buildings sufficiently large to require two or more conductors and "earths," it is preferable to interconnect the conductors, both along the ridge of the building and also round the base as near ground-level as practicable. The path of a conductor from each point to an "earth" should be as short and straight as practicable. The conductor running round the base of the building should also be used as a means of earthing any masses of metal entering into the construction of the building, in the vicinity of the conductors. In the case of buildings containing explosives, it is preferable to bond the various sections of the rain-water pipes and gutters, and connect same to the lightning-conductor system at several points. Water mains form good earth connections, being more reliable than earth plates. As a general rule, two or more "earths" should be fitted to all conductor systems, one or more of which may be a plate and the others water-main connections. Testing of the "earths" (and indeed the whole of the conductor system) should be carried out at least annually, and preferably at the driest season of the year, so as to ensure that a satisfactory value of "earth" resistance is obtained all the year round.

The second award (5s.) is made to "L. R.," who sends a long reply, from which we have extracted the following for publication:—

Earth plates of lightning conductors must be of sufficient size, must be properly joined to the conductor, and must make a proper earth connection. They are generally of either the plate or tube type. Fig. 1 shows an earth plate *a* of copper or galvanised iron, with connections *b* joined thereto at *c*, as



manufactured by a leading company. A medium standard size is 3 ft. by 3 ft. by 0.032 in. thick. The leads, of stranded and insulated wires, are soldered either at the side or in one corner. An ample joint is provided, the War Office practice being to make the joints of six times the area of the conductors. For inserting the plates in the earth a hole about 6 ft. square is dug. This is provided with a bed 2 ft. thick of crushed charcoal, of sufficient depth to be always damp, and this dampness

must communicate with the main body of water. A further 2 ft. of crushed charcoal is added after the plate is inserted, and the hole is afterwards filled with earth, and plenty of water added. Where natural dampness cannot be reached, some water arrangements must be provided. Fig. 2 shows a tube type, comprising a perforated steel pipe *d* about 2 in. in diameter having a spiked end *f*. Lengths of pipe are connected as the tube is driven down, and the conductor *j* is threaded through the cast-iron projecting top piece, an electrical joint being made by pouring lead into the socket. In order that there shall be permanent dampness, a pipe *j* connects with a gutter *h*, which is placed beneath a rain-water pipe *i*. The construction is completed by a head *e*, which serves to mark the position of the plate. Another tubular form is shown in Fig. 3, and this comprises a tube *m* of about 1 ft. diameter placed in a well, and extending 10 ft. below the water-level in the driest weather. The tube is surrounded by a tube of diameter of about 3 ft. of broken coke, and no mortar or cement is used. Figs. 4-9 illustrate all the earthing arrangements which have been patented in this country from 1884 to the end of 1908. Varley (13,720/88) proposed to provide a network of metal under the basement and round the walls of the building to be protected, this being connected to the conductor and to all the external metal work of the building. Ball (20,726/93), Fig. 4, continues the lightning conductor *b* so that it itself forms the ground plate *g*, it being suitably wound up to effect this. Hedges (19,678/99), Fig. 5, utilises a tube *r* through which the sheathed conductor passes, the tube being packed with carbon and the conductor extending into the cap *v*, which is provided with holes *w*. The conductor is soldered to the head *s*, and the arrangement is completed by an elbow *u* for the supply of water and ring *t*. Immich (23,294/01), Fig. 3, provides two earth plates, *y* and *z*, the first connected to the conductor by the lead 2 and the second to the first by the lead 3. The bottom plate is made of a more electro-positive metal than the top, and is situate always in water. Barland (17,246/06) surrounds earth plates by sawdust saturated with a solution of calcium or magnesium chloride. Highfield (1,947/06), Fig. 7, takes the conductor (5) through an insulating tube (7) into a well (4), and spreads it at the bottom (6). The depth may be 100-200 ft., or until a suitable wet stratum is reached. Ransford (1,995/06), Fig. 8, attaches a lightning conductor to a metal post (8), the base of which fits into a metal socket (9) through a cap (10), the two being secured by the wedge (11), and lugs (12) provided to which a base plate can be attached. Collyer (22,500/06) encases the earth ends (13) of lightning conductors in lead or other good conducting and corrosion-resisting material, such as tapes (14) (Fig. 9). It is desirable to use two separate earth plates, one situate near the surface and the other one deeply buried until continuous water is reached. These two should be electrically connected (see Fig. 6). The reason is that after a heavy spell of dry weather, although the first plate may be almost ineffective, the second acts sufficiently well, but after a sudden heavy downfall the first makes a more efficient earth.

"L. R.," then, replies to the first part of the question, and agrees that the plates are rather small, although he does not consider the resistance of 17 ohms unduly high.

**Preferential Charging at Ilford.**—The action by the Attorney-General (at the instance of the Ilford Gas Co.) against the Ilford Urban District Council with regard to preferential charging and hiring out apparatus was down in the Law List to commence on Tuesday, in the Chancery Division. It has, however, been agreed to postpone the action until the first Tuesday in the next sittings. Mr. Justice Sargant will hear the case.

**Arrangements for the Week.**—(To-day) Thursday, Dec. 10th.—Institution of Electrical Engineers. "Automatic Protective Switchgear for Alternating-Current Systems," by E. B. Wedmore. 8 p.m.—Greenock Electrical Society. "The Electrical Equipment of a Liner," by J. E. Allan.

Friday, Dec. 11th.—Electro-Harmonic Society Smoking Concert. Holborn Restaurant. 8 p.m.

Saturday, Dec. 12th.—Birmingham and District Electric Club, Swan Hotel, New Street. Annual Dinner and Ladies' Night, 7.30 p.m.

Monday, Dec. 14th.—Institution of Electrical Engineers. Newcastle Local Section. At Mining Institute. "Cables," by C. J. Beaver. 7.30 p.m.

Tuesday, Dec. 15th.—Institution of Electrical Engineers. Manchester Section. At Engineers' Club. "Automatic Protective Switchgear for Alternating-Current Systems," by E. B. Wedmore. 7.30 p.m.—Association of Supervising Electricians. St. Bride's Institute, Fleet Street, London. "Wiring Systems," by C. J. Banister. 8 p.m.

Wednesday, Dec. 16th.—Institution of Electrical Engineers. Birmingham Section. At University. Mr. Wedmore's paper will be read. 7.30 p.m.—Royal Microscopical Society. 20 Hanover Square, W. "X-Rays in Relation to Microscopy," by J. E. Barnard. 8 p.m.

Friday, December 18th.—Wireless Society of London. At I.E.E. "High-Frequency Resistance of Wires and Coils," by Prof. G. W. O. Howe. 8 p.m.



### MIND THE "FLEX"

THE necessity of replacing badly-kinked "flex" is more or less obvious to consumers as well as to wiring contractors, but a short Paper by Messrs. S. W. Melsom and H. C. Booth, in the *Journal of the Institution of Electrical Engineers* for Dec. 1st, shows that it is desirable to renew periodically the flex used for ordinary pendants and small heating apparatus before it presents outward and visible signs of deterioration. In experiments made by the authors at the National Physical Laboratory for the Wiring Rules Committee of the Institution, measurements were taken of the rise in temperature of the flex due to the heat arising from pendants with various classes of shades, irrespective of that due to the ordinary C<sup>2</sup>R losses in the wire. In a number of cases the heat from 55-watt lamps sufficed to increase the temperature at the cord grip by 43° F., or about twice the temperature-rise allowed by the Wiring Rules for rubber insulation. Examination of the wire showed that the rubber was practically destroyed, and, in the case of silk-covered wires, the covering was weakened.

Experiments made with a large number of different classes of electrical heating apparatus demonstrated that reliance should not be placed on rubber insulation on connecting wires within the apparatus, except possibly in the case of small radiators. With such things as electric irons and hot-plates the rise in temperature of the flex within 3 or 4 in. of the connection sockets was usually considerably in excess of 30° F., which, assuming the maximum air temperature of the room to be 80° F. and the rise due to C<sup>2</sup>R loss in the wire 10° F., brought the actual temperature to 120° F., the accepted safe temperature limit for rubber. It must not be forgotten, however, that the rise in temperature which destroys the rubber will be sufficient to keep the textile material forming the remaining part of the insulation free of moisture, so that if this is of a nature to withstand the final temperature, no serious trouble need be apprehended.

### THE HEATING OF LAMP HOLDERS

THE results of a series of experiments on the heating of lamp holders, carried out at the National Physical Laboratory for the Engineering Standards Committee, are given in a Paper by Mr. C. C. Paterson, published in the *Journal of the Institution of Electrical Engineers*. The author points out that the maximum number of watts that may be safely transmitted by a screw-socket lamp holder depends on different considerations from those which prevail in the bayonet holder. The limiting factor in the bayonet socket is the gradual weakening of the plunger springs which takes place when the temperature reaches too high a value. The screw socket has no such springs, but connection is made to the lamp-cap terminals by what is equivalent to a clamped contact as the lamp is screwed into place. The general conclusions arrived at as the result of the experiments are that as far as temperature rise is concerned ordinary screw-socket holders may be used for radiator elements up to at least 500 watts each; and that the screw contact is also satisfactory, as at present used, for lamps rated up to at least 1,000 watts, but in the present designs the clamping contacts for the incoming leads become too hot to allow rubber-insulated cables to be brought direct into the sockets without risk of serious deterioration of the rubber.

### THE GERMAN ELECTRICAL INDUSTRY

AN article in the *Zeitschrift für Dampfessel und Maschinenbetrieb* for Nov. 20th, which has reached us via Switzerland, reviews the condition of the German electrical industry at the end of August. In the first weeks of the month no new orders of any magnitude were placed, but towards the end of the month army contracts and other orders increased. Manufacturers of dynamos, motors, and transformers who were not supplying plant for military purposes, however, were generally obliged to work on short time, in some cases only five hours a day. Some of the War Office contractors, on the other hand, found it necessary to work overtime. Makers of other apparatus for electric light and power were seriously affected, and had in some cases to shut down altogether. Installation firms also reported slackness, but installations for military purposes just kept them occupied. Cable-makers and manufacturers of insulating material were also engaged chiefly with Government orders, and although some firms were working full time, others reduced their hours to 60 per cent. Statistics from twelve firms showed that the number of men employed at the end of August was only 9,419, as compared with 15,234 last year—a reduction of nearly 40 per cent.

### ELECTRIC TRACTION NOTES

Referring to the difficulty of obtaining petrol for motor-cars in Germany during the war, the *Zeitschrift für Dampfessel und Maschinenbetrieb* mentions the advantages of electric cars and the large use of them in America. In March this year statistics showed that there were only 3,170 electric cars in Germany, as against 34,075 in America at the end of 1913. The latter figure is actually about half the number of motor-cars in Germany altogether, viz., 78,000. On the other hand, only 3 per cent. of the passenger cars in America are electric, but of the commercial cars, 17,687 out of 77,996 were electrical.

The Annual Report of the Postmaster-General refers to the tube railway being constructed by the Post Office from Paddington to the Eastern District Office in Whitechapel, with intermediate stations at Western Parcels, Western District, and West Central District Offices, and Mount Pleasant, King Edward's Building, and Liverpool Street. The line will be worked electrically, and the tunnel between the stations will be 9 ft. in diameter, and will contain two tracks. The stations will consist of an island platform, in the centre of which electric lifts and conveyors will be provided in order to secure the expeditious transfer of mails between the platforms and the sorting offices. The trains, which will be made up of one, two, or three trucks, will not require drivers, but will be operated by a system of distant control from cabins situated at the stations. It is estimated that the trains will run at an average speed of 25 m.p.h.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

It is stated that two semi-automatic exchanges have been fitted at Zurich, and that under the new arrangements from 600 to 1,000 subscribers are dealt with per operator's position.

The December issue of the *Telegraph and Telephone Journal*, among other interesting items, contains a remarkable personal description of the last work of operators in the Antwerp Central Telegraph Office, and their flight at the fall of that city; and some experiences of a British engineer officer on active service.

The sentence imposed by Court Martial upon the German named Harold Fochtenberger, for having a wireless telegraph apparatus at Thorpe Bay, is three months' detention. The original sentence was six months with hard labour, but this was subsequently reduced. We gave particulars of the charge against the prisoner in *ELECTRICAL ENGINEERING*, Nov. 12th, p. 590, and Nov. 19th, p. 600.

A Court Martial has also been held at Hull with regard to a charge against A. G. Cox, Bungalow Aerodrome, Filey, for having a wireless apparatus in his possession. It was stated that prisoner was British-born, and is the travelling representative of a Wolverhampton engineering firm, and that he used the wireless apparatus for lecturing to Boy Scouts. A representative of the General Post Office stated that the apparatus could transmit to a distance of five miles. The decision of the Court will be announced in due course.

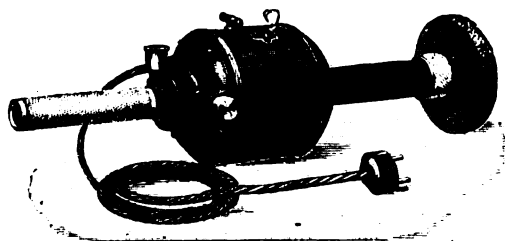
The *Wireless World*, in some interesting notes on wireless and the war, attributes the German Navy's knowledge of the movements of our ships in the Pacific, which led to the action off the Chilean coast, to the presence of a number of wireless stations in the neighbourhood manned by German operators. It is stated that these stations were equipped under cost price by a German company, and provided with such complicated receiving apparatus that the German operators sent out to erect them had to be retained, so that in this way the German Intelligence Department obtained a valuable secret "Imperial wireless chain." The remedy suggested is the adoption by British ships when communicating with one another of a "Bridge" transmitter, which has only a short range, so as not to be overheard.

The Netherlands Indies Administration state that they authorise the use of Dutch, Malay, German, and English in plain language telegrams.—The cable between Australia and New Caledonia has been restored.—The Mole St. Nicholas-Port-au-Prince cable is down. Telegrams for the latter place are sent by land-lines of the Haitian Republic at the same rates as for "other places" in Hayti.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### AN ELECTRIC HAND GRINDING MACHINE

A VERY serviceable form of electric hand grinding machine has just been placed on the market by Morris & Lister (London) Ltd. (3 and 4 Palace Chambers, Bridge Street, Westminster, S.W.). This machine, which is especially suitable for use in foundries, is provided with long hand grips, fixed at the ends in line with the shaft of the motor, thus enabling the machine to be handled with the greatest facility owing to the good distribution of weight. The arrangement of the handles also ensures that the grinding wheel is not interfered with in whatever position it might be desired to use the machine. The machine can



ELECTRIC HAND GRINDER.

be used for finishing up castings of any shape, and in many cases enables rough filing to be entirely done away with. The weight is only 13 lbs. with a  $\frac{1}{4}$ -h.p. motor, and this size machine is capable of being used with an emery wheel up to 4 in. diameter by  $\frac{1}{2}$  in. in width. Both D.C. and three-phase machines are obtainable, the former being adapted to run at a speed of 2,400-4,000 r.p.m. and the latter at a speed of 2,400-2,800 r.p.m. The motor of the D.C. machine is a  $\frac{1}{4}$  h.p. and that of the three-phase machine  $\frac{3}{4}$  h.p. The machine is of neat appearance and solid construction, and the price has been kept as low as possible. Such a machine should be very useful as a means of replacing hand filing and grinding generally in works operations.

### AN ENGINE REVOLUTION TELL-TALE

A NEW instrument has been placed on the market by Siemens Bros. & Co., Ltd. (Woolwich), for indicating the revolutions of marine engines electrically without the use of rubbing contacts. The transmitter, placed near the engine shaft (Fig. 1), consists of an electromagnet provided with two windings, one of which is connected to the lighting supply of the ship, whilst the other is connected to the indicator (Fig. 2). An iron armature fixed to the shaft

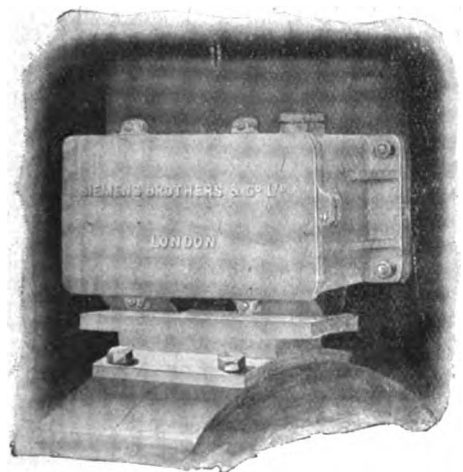


FIG. 1.—TRANSMITTER.



FIG. 2.—INDICATOR.

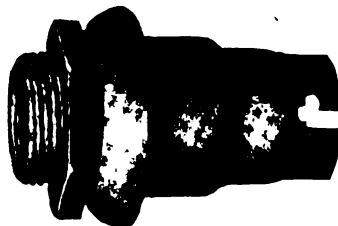
passes, during each revolution, the poles of the electro-magnet, thereby inducing a current in the second winding which actuates a small flag in the indicator, moving it across a window at each revolution of the shaft. There are two flags and windows on the indicator, one for each direction of

rotation of the shaft, and a two-way switch is provided which is actuated by the reversing gear, and connects either the one or the other winding of the indicator, depending on the direction of rotation of the shaft.

The indicator is provided with a lamp for illuminating the windows for night-work, and the flag and window project in a semicircular shape, so as to be more easily seen from the side. A switch is provided to disconnect the mechanism when not required. Each part is contained in gun-metal water-tight cases, and is strongly constructed.

### A WATERTIGHT LAMPHOLDER

A NEW pattern of watertight lampholder, constructed of galvanised steel, has been brought out by Simplex Conduits, Ltd. (116, Charing Cross Road, W.C.). As will be seen in the illustration, the holder is provided with a drainage lip, which effectively carries the drip water clear of the lampholder shell; the length of thread has been increased to about  $\frac{5}{8}$  in., and on the shade carrier pattern a



GALVANISED WATERTIGHT LAMPHOLDER.

sensible method of attaching the shade has been incorporated. This holder is particularly suitable for use in exposed situations, such as factories, yards, subways, station platforms, outside lighting installations, etc., and will resist the attacks of impurities in the atmosphere, which quickly make the ordinary brass lampholder corrode.

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**RADIATORS.**—A new list of radiators and other heaters has been issued by the Edison & Swan United Electric Light Co., Ltd., in which a general revision of prices is noticeable on account of the changes in the cost of raw material. Several new patterns are included. The types of heater dealt with comprise "Quartzalite" heaters of the latest type, lamp radiators, non-luminous convectors, combined radiators and convectors, and hot bar radiators.

**RADIATOR LAMPS.**—A leaflet from the Stearn Electric Lamp Co., Ltd. (47 Victoria Street, S.W.), deals with Stearn radiator lamps. These are now supplied in the usual 250-watt size, with either bayonet or Edison screw caps. In the latter case, the brass collar is insulated from the Edison screw, making the lamp shockproof.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

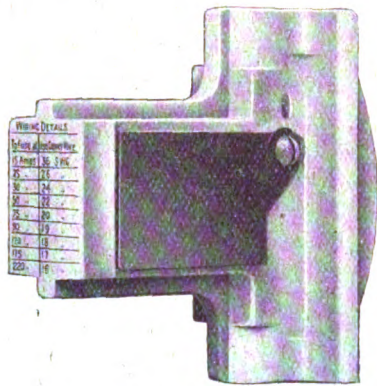
**TIME SWITCHES.**—A list of a large number of patterns of time switches and sign flashers is to hand from W. Geipel & Co. (Vulcan Works, St. Thomas Street, S.E.). The former range in capacity from  $1\frac{1}{2}$  to 250 amperes, and include a special form for staircase or corridor lighting. Two distinct types of time switch are dealt with, the first arranged for switching on by hand and off automatically, and suitable for the restricted hour or two rate system, while the second switches both on and off automatically, and is used for street lighting, signs, &c.

**BOILER FITTINGS.**—A catalogue from the sales department of the National Boiler and General Insurance Co., Ltd. (National Buildings, St. Mary's Parsonage, Manchester), deals with such boiler fittings as fusible plugs, safety valves, hydraulic test pumps, indicator and testing cocks, salinometers and alkalinity testing apparatus, plate gauges, test drills, pressure gauges, water gauges, thermometers, and various accessories for engine and boiler testing.



### THE "FLUVENT" FUSE

WE have received from Parmiter, Hope & Sugden, Ltd. (Hulme Electrical Works, Manchester), particulars of the porcelain tube fuses which they manufacture on their patent "Fluvent" system. The "Fluvent" fuse is a tubular fuse, having the fuse wire placed diagonally across the tube instead of straight down it. The wire passes through small holes from one contact to the other, the contacts being placed at the sides instead of at the ends of the tube, preventing any tendency to arc from contact to contact. When the fuse is in position, the fuse wire being arranged obliquely across the tube, the blow-out effect of the tube tends to blow the arc away from the contacts instead of towards them. It



"FLUVENT" FUSE CARRIER.

will be seen that by this arrangement it is possible to have a fuse with a very short break, and consequently the running temperature of the fuse is low, and the usual trouble from ageing of copper fuses through oxidation is avoided. The size of wire to fuse at various currents is printed on the back of each fuse, as seen in the illustration. The sockets for these fuses are of very convenient shape for ready insertion of the fuse-carrier into the contact clips, but the contacts are nevertheless readily accessible for inspection and adjustment, owing to an extremely ingenious method of mounting up for distribution boards. The reduction in size compared with boards of the ordinary works type is enormous. A pamphlet issued by the firm gives particulars of some interesting experiments carried out by Mr. S. L. Pearce, of the Manchester Electricity Works, on the wonderfully efficient behaviour of the fuse on short-circuit and in breaking circuits of large inductance.

### COMBINED REFLECTORS AND LAMPHOLDERS

AMONG the items in the new season's catalogue just issued by the Benjamin Electric, Ltd. (1A Rosebery Avenue, E.C.) are the steel reflectors complete with holders illustrated in Fig. 1. The holder is of their well-known

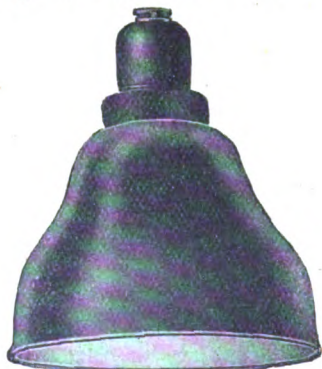


FIG. 1.—COMBINED LAMP-HOLDER AND REFLECTOR.

"Benco" weather-proof china insulated type, fitted in some cases with lever switch, as shown in Fig. 2. The steel shades are also a well-known speciality of the firm, with a special easily cleaned reflecting surface. An extensive variety of both lamp-holders and shades are listed, and a novelty appearing for the first time is the steel reflector

with concentrically fluted surface, shown in Fig. 3. We understand that these have been employed with great success



FIG. 2.—BENCO HOLDER WITH SWITCH.

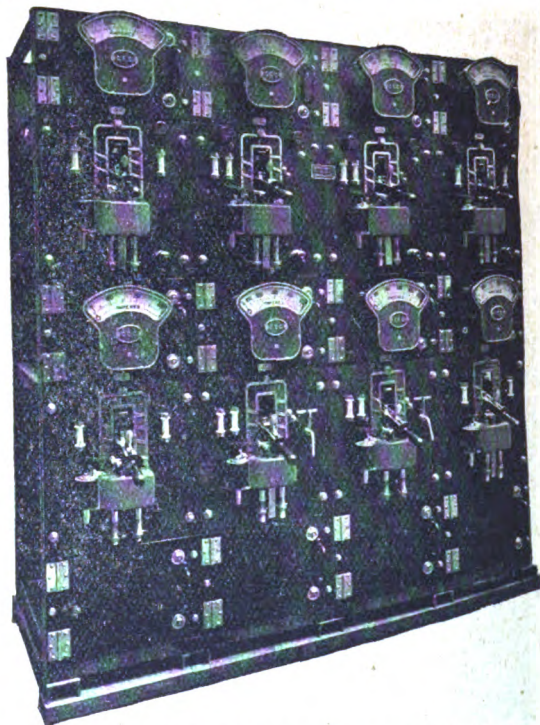


FIG. 3.—CONCENTRICALLY FLUTED REFLECTOR.

in the lighting of textile mills, and are eminently suitable for use with traction lamps. There are many other items, including wireless cluster bodies, trough reflectors, electric horns, and the well-known Benjamin friction driven screw-drivers, and useful sets of tools on the same principle—and the list is of special interest in view of the present demand for British-made goods.

### A COMPACT SWITCHBOARD

ONE of the most troublesome restrictions in switchgear design is lack of space. A recent example of a large amount of switchgear compressed within small dimensions is illustrated here. This is a boiler-plate cubicle for alternating-current work supplied by the General Electric Co., Ltd. (Witton, Birmingham, and 67 Queen Victoria Street, London, E.C.), to an important firm in the Midlands, for whose works they are undertaking the complete electrical equipment. This and a sister board had to be placed in a very cramped position; the dimensions were so small that two panels had to be mounted directly over each other. Being composed of boiler-plate cubicles it was necessary to



BOILER-PLATE SWITCHBOARD SPECIALLY DESIGNED FOR COMPACTNESS.

provide inspection-doors, which gave not only a good view of the interior but enabled work to be carried out inside the board should it become necessary. A number of doors are provided for this purpose, and several had to be utilised to accommodate the instruments. In the interior, too, the whole of the gear had to be compressed, and this has been accomplished without any material reduction in the factor of safety. It is of interest to note that the whole of this board throughout is of G.E.C. construction, including the switches, instruments, instrument transformers, fuses, tumbler switches, and so forth.



## AN ATTRACTIVE SHOWCARD

OUR readers will all have admired the General Electric Co.'s bold and vigorous Osram lamp design on our front cover this week. It is impossible, however, to do full justice in monochrome to the artistic merit of the original from which it is reproduced. This takes the form of a new show-card printed in ten colours, just produced by the Company, which happily combines bold colouring, harmonious design, and a commanding appeal to the eye, worthy of the quality of the British-made lamps to which it calls attention.

## CORRESPONDENCE

## LAMP WORKS AND THE ADMIRALTY.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—The Lemington Glass Works, which are principally engaged in manufacturing bulbs for the "Osram" and "Robertson" lamps, have been heavily taxed since the outbreak of war by urgent Government orders. In addition to the seventy-four men who have enlisted from the lamp works, a very large number of men have left the glass works to join the Army. The martial spirit among the men is very great, and in this connection a very large number of bulb-blowers having expressed their desire to join the Army, the Admiralty were informed that this might entail delay with their work, and the result has been a communication from the First Lord of the Admiralty to the employees of the Lemington Glass Works to the following effect:—

"Admiralty, Whitehall, S.W.,  
"December 5th, 1914.

"I wish to impress upon those employed by your establishment the importance of the Government work upon which they are engaged. I fully appreciate the efforts which the employees are making, and the quality of the work turned out, and I trust that everything will be done to assist the Naval Authorities by pushing on all orders as rapidly as possible. I should like all engaged by your establishment to know that it is fully recognised that in carrying out the great work of providing for the requirements of the Royal Navy, they are doing their duty for their King and country equally with those who have joined H.M. Forces for active service afloat or ashore.

"(Signed) WINSTON S. CHURCHILL."  
Yours faithfully,  
OSRAM LAMP WORKS, LTD.  
(C. Wilson.)

Brook Green, Hammersmith, W.

## SHOP LIGHTING.

To the Editor of ELECTRICAL ENGINEERING.

SIR,—Owing to the police regulations, the subject of shop-window lighting has received more attention recently than it has ever done. A walk down any of our leading shopping thoroughfares on any evening will be rewarded by the sight of many amateurish attempts at light diminution. A much favoured method is the fixing of tissue paper shades round bare lamps; this is not only ineffective from an illumination standpoint, but is a distinct source of danger, as witnessed by the large amount of badly scorched tissue paper seen. As a result of the lack of illuminating knowledge, the results achieved are, more often than not, gained at the expense of practically the total sales-value of the show window itself. Yet it is quite possible to light a window in such a way as to ensure a brilliant light on the goods and, at the same time, avoid glare on the pavement.

The British Thomson-Houston Co., Ltd., have, as you know, had a large amount of experience in shop lighting, both for the inside of the shop and for the show window. Those of our customers who installed concealed lighting before the war have had cause to congratulate themselves since the war, as they have been called upon to make few, if any, alterations in their lighting arrangements.

It is with a desire to assist your readers that I am writing this letter to inform them that they can call upon our illuminating engineers for free advice as to the lighting of windows in an efficient and approved manner.

Yours very truly,

F. W. WILLCOX,

General Manager, Lamp and Wiring Supplies Dept.

Mazda House,

77 Upper Thames Street, E.C.  
Dec. 4th, 1914.

## TRADING WITH THE ENEMY.

Mr. T. W. Cole writes us that contracts between British subjects and corporations and alien enemies involving quite a colossal amount in the aggregate, are being held up pending definite legislation as to whether they can be deemed to be cancelled or suspended. He emphasises the desirability of such legislation as soon as possible to enable these contracts to be transferred to British firms, and to give employment to British labour.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Birmingham.**—Owing to the abnormal requirements of the city for electric power purposes, the Electric Supply Committee has held a special meeting to consider the question of installing further generating plant.

**Blackpool.**—The Electricity Committee has appointed a deputation to inspect modern types of boilers. Extensions estimated to cost £25,000 are contemplated, and the Committee requires the most up-to-date boiler plant available. Tenders for certain portions of the work have been accepted and are referred to in another column.

**Colwyn Bay.**—A loan of £35,000 for the construction of a new power station in conjunction with a refuse destructor is to be applied for. It is intended to instal a 1,500-kw. 6,000-volt turbo-alternator which will transmit power to the existing power station, where it will be transformed down.

**Coventry.**—A loan of £55,897 is to be applied for in connection with new plant and buildings at the power station. The present demand practically exhausts the whole of the steam-raising capacity, and in view of the fact that so many firms are putting down additional plant for which the Corporation will be called upon to supply the necessary electrical energy for driving, it has been decided to instal four new boilers each capable of evaporating 30,000 lb. of steam per hour with the necessary generating plant.

**Dover.**—It is proposed to instal a 1,000-kw. turbo-alternator.

**Torquay.**—The L.G.B. has sanctioned a loan of £15,860 for extensions to the electricity undertaking. Of this £13,000 is for new plant and machinery and the remainder for buildings.

**Turton.**—Sanction has been received to a loan of £3,560 for prospective expenditure on mains, services, and meters.

## Wiring

**Exeter.**—Sanatorium.

The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.

**Blackburn.**—New fire station.

**Chester.**—New elementary school.

**Crewe.**—Offices for Prudential Assurance Co.

**Devonport.**—New elementary school.

**Hanwell.**—Isolation hospital (£5,000).

**London: Islington.**—New free library.

**L.C.C.**—New North-Western Polytechnic.

**Preston.**—Baths in Walker Street.

**Salford.**—Hospital at Nab Top Farm, Marple (£27,000).  
Town Clerk.

**West Bromwich.**—New post office. H.M. Office of Works,  
London.

## Miscellaneous

**Leeds.**—A twelve months' supply of electrical stores is required by the Garforth Colliery Co. Dec. 24th.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Blackpool.**—The following tenders have been accepted:—1,500-kw. turbo-alternator, British Thomson-Houston Co.; surface-condensing plant, Cole, Marchant & Morley; L.T. cable, W. T. Glover & Co.; H.T. cable and copper trolley wire, British Insulated & Helsby Cables; iron switch fuse pillars, Sykes & Sugden.

**Dublin.**—The Electric Supply Committee reports that, having been compelled to cancel a contract with a Nuremberg firm for arc-lamp carbons, it has purchased at an increased cost 2,000 pairs of carbons from the London Continental Stores Co., which made the lowest offer for early delivery.

**London.**—The Tower Cinema Picture Theatre, recently opened at Peckham, is fitted throughout with Pope "Elasta" wire lamps, some 2,500 lamps being installed.

The General Electric Co. has again been successful in securing a twelve months' contract for the supply of Osram shiplighting lamps from the Cunard Steamship Co., Ltd.



**Manchester.**—Contracts for cable have been placed with British Insulated & Helsby Cables and the Macintosh Cable Co.

**Tunbridge Wells.**—The Corporation have adopted a recommendation for additional heating at the sanatorium by electricity. This is to be carried out by the "Hestia" type of radiator, the installation having a total capacity of 24 kw.

## APPOINTMENTS AND PERSONAL NOTES

Mr. T. A. Edison has been elected an Honorary Member of the Illuminating Engineering Society, "for services rendered to the cause of illumination."

A lighting superintendent, under the control of the Chief Electrical Engineer, is to be appointed at Dublin, at a salary of £200 rising to £300 per annum.

Mr. Duncan Watson has taken over the Chairmanship of the Marylebone Electricity Committee.

Mr. Wright has been appointed mains assistant in the Dover electricity undertaking, at a salary of £117 per annum.

An assistant electrical engineer is required by the Croydon Corporation. Salary £250 rising to £350 per annum. Dec. 17th. Town Clerk.

A charge engineer, two junior engineers, and four switchboard attendants are required at Bolton. Borough Electrical Engineer.

A junior assistant is required in the Ventnor electricity works.—A sub-station attendant is required in the Ipswich electricity works.—Temporary switchboard attendants are required for L.C.C. Tramway sub-stations. (See advertisements on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £58 10s. to £59 (last week the same).

**Liquidations.**—A meeting of the Jandus Arc Lamp (Continental Patents) & Electric Co., in voluntary liquidation, will be held at Messrs. A. Gillies & Co., 40 Brown Street, Manchester, at 12.30 p.m., on Dec. 30, to hear the liquidator's account of the winding-up.

**Change of Address.**—The offices of Rushmore Lamps, Ltd., have been transferred to their works at 26A Peterborough Road, Parsons Green, Fulham, S.W. (Telephone: Putney 2490 and 2491; Telegrams: Aplanatic Ful.).

**Italian Agency.**—An Italian agent desires to secure the representation of United Kingdom manufacturers of electric lamps and apparatus. The name and address is on file at 73 Basinghall Street, E.C.

## LOCAL NOTES

**Arbroath: Electricity Works Assessment.**—The appeal recently reported in these columns of the Arbroath Electric Light & Power Co. against the assessment of their works at £1,215 came before the Land Valuation Appeal Court last week. The argument is that the proper basis of assessment is to take the average of the previous three years, and not the figure for the previous twelve months. It was asked that £500 should be the figure, but the Court by a majority,

and, of course, without giving reasons, fixed the figure at £1,100.

**Eastbourne: Difficulties through Enlistment.**—The Borough Electrical Engineer having reported that owing to the number of men from his staff who have enlisted, he will find it difficult to keep the works going if others follow suit, it has been decided that members of the electricity staff desiring to enlist shall obtain the consent of the Committee before doing so.

**India: Ventilation.**—According to the *Indiaman*, Mr. J. W. Meares, the electrical adviser to the Government, has devised a system of forcing artificially cooled air through hollow walls for keeping premises cool. Tests will be carried out at the new Chief Court at Lahore, and a house similarly constructed is to be erected in the new Delhi.

**London: Islington: Electric Power Scheme.**—Mr. A. Gay, Borough Electrical Engineer, has reported, after having attended a conference of London local authorities at the Shoreditch Town Hall, that it was decided to recommend all the London boroughs owning electricity undertakings to present individual petitions against the London County Council Power Bill.

**Pontypridd: Bulk Supply.**—The Borough Electrical Engineer has reported that certain conditions in the proposed agreement with the South Wales Electrical Power Distribution Co. for a bulk supply are quite unacceptable. Among these he specifies the clause by which the Council would have to take a supply for a long number of years, and to pay a minimum amount of £150 per annum. This supply is only for an outlying portion of the Council's district.

**West Ham: The London Power Scheme.**—The London County Council power scheme was the subject of a prolonged discussion at the last meeting of the Corporation, during the course of which Alderman White said he had information to the effect that the London County Council proposed to drop West Ham out of the scheme altogether. Alderman Littler, Chairman of the Electricity Committee, said he was not aware of this. One point which the Electricity Committee are considerably apprehensive about is that the L.C.C., although taking powers to supply in bulk by agreement to existing authorities, also take compulsory powers to supply to docks, railways, &c. At the present time West Ham supplies some millions of units annually to the Port of London Authority, and naturally resent any competition of the sort foreshadowed in the L.C.C. Bill for this supply.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**Allgemeine Elektrizitäts Gesellschaft.**—Reference is made in the Swiss papers to the report of the A.E.G. for the half year ended 30th June, 1914. This, of course, covers a period before the war broke out, and the profits were sufficient to allow of a dividend equal to that of the previous years, i.e., 14 per cent. On account, however, of the uncertainty of the situation and the losses bound to occur in respect of both the company's home and foreign trade a dividend of only 10 per cent. was finally declared.

**Aron Electricity Meter.**—The directors have announced that it is not their intention to pay an interim dividend on the preference shares.

**The British Westinghouse Co. and the War.**—In our issue of Sept. 10th, p. 496, we mentioned how the British Westinghouse Co. was encouraging all its eligible employees to join the Forces. We now understand that 1,046 men have joined, and we regret to hear that two have already been killed at the front. It is also interesting to note that the aviator Sippe, who was one of the three to throw bombs on the German airship hangars at Dusseldorf, is an ex-Westinghouse man. The Company is dealing with 422 cases of dependents per week, and there is a standby fund which amounted to £1,705 at the beginning of November. Two rifle ranges have been erected in the works grounds for the use of those not eligible to join the Forces.

**The Sales Managers' Association.**—At a meeting of this Association at the Holborn Restaurant on Thursday, Dec. 17th, at 8 p.m., Mr. H. Scholey will open a discussion on the position of the British electrical industry and methods of extension in the markets of the world. A number of prominent electrical engineers are expected to be present. Those desirous of attending are invited to communicate at once with the hon. secretary of the Association, Mr. F. R. Jones, Sardinia House, Kingsway, who will be pleased to supply particulars and send an invitation.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 416 [VOL. X., No. 51]  
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THURSDAY, DECEMBER 17, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.  
SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

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Telegrams: "Circling, Fleet, London." Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

ADDITIONAL regulations have been issued for still further reducing the amount of lighting in the streets of London. Rear lights are also compulsory upon all vehicles (p. 637).

THE relative advantages of the various systems of automatic feeder and machine protection were discussed at the Institution of Electrical Engineers last Thursday. Mr. Wedmore, the reader of the Paper, preferred the split conductor method for ordinary feeders, the "core-balancing" system for tail-ended feeders, and the Merz-Price system for generators, etc. (p. 638).

THE interruption of supply to the L.C.C. Tramways on Friday afternoon was due to a fire on the wooden staging erected in connection with switchboard extensions at the Greenwich Generating Station. This fire was caused by the failure of an old instrument transformer, and all the generator cables became involved in it (p. 639).

A FEW modifications are suggested by the Parliamentary Committee of the L.C.C. in the Draft Bill dealing with electricity supply. An important one is that, assuming no agreement can be come to with a leasing company, the new Authority shall retain the proposed control over the existing Supply Authorities in the scheduled area (p. 639).

THE principles, design, and use of static balancers are dealt with in our "Questions and Answers" columns (p. 640).

AN electrolytic cleaning machine, an electric oven,

an alternating current meter, and a magneto hand lamp are described in specifications published at the Patent Office last Thursday. They also include a Betulander telephone patent and that for the Squier "wired wireless" telegraph system. Application has been made to revoke one of the patents for the "Brolt" car lighting system. A B.T.-H. patent for inverted rotary converter control expires this week after a full life of fourteen years (p. 641).

RECENT telegraph and telephone progress in this country is reviewed in the Postmaster-General's annual report. A few details are given of the Marconi Wireless Telephone (p. 642).

OUR trade section contains descriptions of a luminous helm indicator, an electric sign, an alternator regulator, and a metal-filament traction lamp (p. 643).

LEGAL proceedings are again threatened by the Sheffield electrical contractors against the Corporation with regard to the Wiring Department.—Competition between the Electricity and Gas Departments at Bolton is complained of.—The street lighting at Southport is to be considerably curtailed owing to shortage of carbons (p. 644).

A LOAN of £30,000 is to be taken up at Greenock; £2,100 at Weymouth; £1,350 at Newcastle-under-Lyme; £675 at Altrincham; and £273 at Middleton.—Rotary-converters and cables are required at Wednesbury and transformers at Bacup (p. 645).

**Arrangements for the Week.**—(To-day) Thursday, Dec. 17th. Institution of Electrical Engineers, Yorkshire Section. At Hotel Metropole, Leeds. Sir John Snell (President) will attend. Resumed discussion on Mr. Selvey's Paper on "Power Plant Testing." 7.15 p.m.

Friday, Dec. 18th.—Institution of Mechanical Engineers. Five Papers on "Audible and Other Cab Signals on British Railways." 8 p.m. Wireless Society of London. "High Frequency Resistance of Wires and Coils," by Prof. G. W. O. Howe. 8 p.m.

Saturday, Dec. 19th.—Association of Mining Electrical Engineers. West of Scotland Branch. At Royal Technical College, Glasgow. "Experience of Surface Earthing in Scottish Mines," by P. S. Glover. 4.30 p.m.

Monday, Dec. 21st.—Institution of P.O. Electrical Engineers at Institution of Electrical Engineers, Victoria Embankment. "Power Circuit Interference with Telegraphs and Telephones," by S. C. Bartholomew.

**Darker London.**—The police authorities in the Metropolitan area have issued further instructions with regard to lighting in the streets, and have now prohibited all lights outside shops. Hitherto the shop-lighting prohibition has been limited to "powerful" lamps, but there has been doubt as to what this exactly meant. Another regulation imposes upon all vehicles the necessity for a rear light. We welcome this much needed requisition, and trust that it will not merely be a temporary measure, but that after the war it will be made a permanent one.

**Northampton Polytechnic Institute.**—At the annual prize distribution and students' conversation last Friday, the prizes and certificates were presented by Lord Moulton, of Bank. The proceedings opened with an organ recital, and the laboratories and workshops of the various departments were open to inspection.

## AUTOMATIC PROTECTIVE SWITCHGEAR

AT the Institution of Electrical Engineers on Thursday, Mr. E. B. Wedmore read a Paper reviewing the various methods of feeder and machine protection on alternating-current systems. For the protection of ordinary feeders, he recommended the "split conductor" system, described fully in *ELECTRICAL ENGINEERING* of Oct. 22nd, 1914. The type of three-core cable, in which each core is divided into two oval-shaped concentric conductors, separated by a comparatively light insulation (Fig. 1 in the article referred to), cost, he said, only slightly more than the standard pattern. In

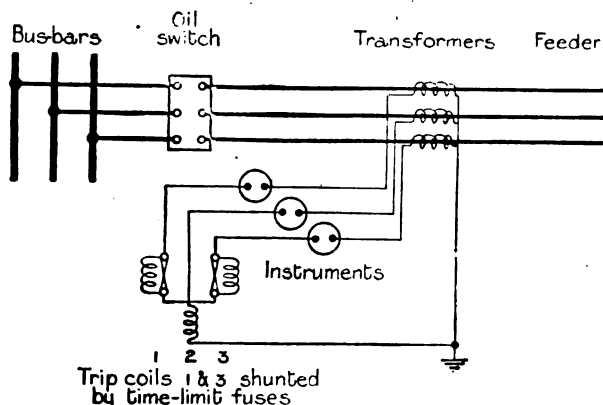


FIG. 1.—CORE-BALANCING COMBINED WITH OVERLOAD PROTECTION.

the case of overhead feeders, the two "splits" are carried on the same insulators in adjoining grooves.

For what the author called "open-ended" feeders—more clearly expressed by the term "tail-ended," which Mr. Clothier employed in the discussion—and also individual motor circuits, isolated transformers, rotary converters, &c., he recommended the "core-balancing" system of protection, which is a development of the method described by Mr. M. B. Field in *ELECTRICAL ENGINEERING* of July 1st, 1909. In the original system, a ring transformer, or rather a ring-

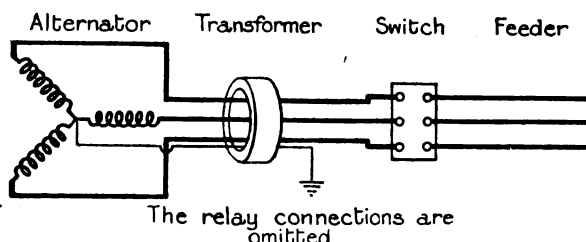


FIG. 2.—SOURCE OF SUPPLY PROTECTED BY CORE-BALANCING.

transformer core with one winding which acted as the secondary, was placed over the three feeders and connected to a relay. Normally the currents induced in the secondary by the three phases neutralise one another, but, if a fault occurs in one phase, this no longer obtains, and the relay is operated and closes the circuit of the trip coil of the main switch. Fig. 1 shows the application of this to combine it with overload protection, by using three ordinary current transformers instead of the ring transformer. A modification

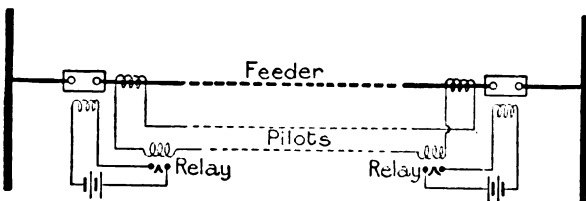


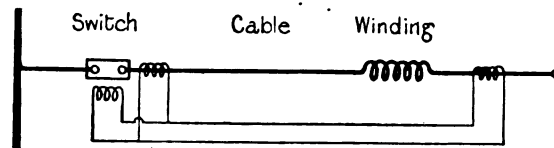
FIG. 3.—PROTECTION OF INTERCONNECTOR BY BALANCED-VOLTAGE SYSTEM.

of this system to protect the generator is shown in Fig. 2, in which, it is seen, the earthing connection of the machine is also brought through the ring transformer.

For protecting generators and banks of transformers, however, the author prefers the modification of the Merz-Price system, shown in Fig. 4. Fig. 3 is a diagram of the ordinary Merz-Price method (called by Mr. Wedmore the "balanced voltage" system), with the two current transformers in opposition, applied to an interconnector between two sub-

stations, and Fig. 4 the modification in which the two transformers simply circulate the current between themselves under normal conditions, and the trip coil is connected in shunt between equipotential points.

A large part of the Paper was also devoted to a critical



Connections are shown for one phase only

FIG. 4.—MACHINE WINDING AND CABLE PROTECTED BY CIRCULATING CURRENT SYSTEM.

review of the various methods of protection with interlocked overload, leakage, or reverse-current relays.

Mr. C. H. Merz, who opened the discussion, said that commercial considerations must ultimately decide the use of any particular apparatus. On the north-east coast they had to supply sub-stations long distances apart by means of one cable, and came automatically to the use of ring mains and static transformer sub-stations without attendants. It was not a question of the cost of the apparatus for feeder protection or the prettiest electrical solution of the problem, but the saving in the lay-out of the system by using this apparatus.

Mr. H. W. Clothier (Reyrolle & Co.) said that the core-balanced system had been used four years ago, and already about 100 circuits were protected by its means. It was a marvel to him that interlocked reverse-current relays had lived so long and still cropped up in specifications. Over 100 miles of cable and overhead lines, he said, were now protected on the split-conductor system, representing over 50 cables. On an estimate, the protective switchgear was called into operation 40 times a year, and on only one occasion had it failed to act as it should have done, and this was due to a fault of construction on the lines themselves, and not to any defect of the system.

Mr. A. M. Taylor (Birmingham Electricity Department) pointed out that the split-conductor system could be of no assistance on existing feeders. He also mentioned that too much reliance must not be placed on the current flowing back to the fault, in the other systems described, as whether this would occur depended on the load normally supplied by the feeder.

Mr. E. G. Waters (Ferranti, Ltd.) described how it was possible by means of his system of feeder protection (see *ELECTRICAL ENGINEERING* of June 25th, p. 369) to overcome the difficulty of applying protection to feeders with T connections to the station side of the feeding point. [We understand that the Ferranti-Waters system is to be applied to protect the cables to be used on the electrification of the London and South-Western Railway.]

Mr. Hollis objected to the Author having said that the devices described acted instantaneously. It took, he maintained, 0.4 sec. for the relay to operate and 0.6 sec. for the switch, and as the rate of rise of current might be 1,000 amperes per sec., the destructive force at the switch break would be considerable.

Mr. H. Brazil (Charing Cross and City Supply Co.) asked what was actually the very little extra cost of the cables on the split-conductor system. He maintained that more than a light insulation was required between the two conductors, as, on a fault occurring, there was the full star voltage between them. He also mentioned that the use of a carbon-powder resistance, with its negative temperature coefficient, would be an advantage for the earthing connection of the centre point of the generator, as it would allow a larger current to pass through the fault to operate the protective device.

Mr. Leonard Murphy (East London College) said that the Author had been too hard on reverse-current relays, and that if there were reactances in the line they had a much better chance.

Mr. Wedmore, in his reply, recommended the Merz-Price system for existing feeders, as it could be applied by means of the existing pilot wires. In reply to a remark by Mr. Taylor as to the extra complication of switches with double contacts on the split-conductor system, he said that it paid to use them rather than to build a bigger transformer. Replying to Mr. Brazil, he said that the cost of the split-conductor system, including the extra cost of the cables, was about the same as the Merz-Price system. The term light insulation between the two conductors was relative; it was sufficient to withstand the full pressure momentarily, and in practice this full pressure was never reached.

**Engineering Societies in Manchester.**—It is now announced that the scheme of co-operation between the various engineering societies in Manchester with a view to the provision of a common meeting room and library, which was considered by a conference last May, has been temporarily abandoned owing to the war.

## THE BREAKDOWN ON THE L.C.C. TRAMWAYS

**B**Y an extraordinary piece of ill-luck the generating station of the L.C.C. Tramways at Greenwich has again been in trouble, and, by a curious accident, was temporarily put out of action on Friday afternoon at about 5 o'clock. Practically the whole L.C.C. tramway service was suspended for many hours, and during the next few days was only resumed gradually day by day, till to-day, for the first time, the full service is running. As our readers know, considerable extensions and improvements to the switchgear are in progress, and a wooden staging had been erected to facilitate this work. Unfortunately, an oil-insulated instrument transformer, already condemned and about to be removed, chose this opportunity to burn out, and the flaming oil set fire to the staging. This fire was very promptly extinguished, but not before the whole of the adjoining main generator cables had been involved, and all these gave out, causing the disconnection of every generator from the bus-bars. The consequent violent surges and current rushes at the moment of short-circuit were successfully withstood by the protective apparatus in connection with the turbo-generators, but two of the old reciprocating sets which are shortly to be removed were slightly damaged, but have been since repaired. No damage of any kind was done to the sub-stations or distributing system. The accident was referred to at Tuesday's meeting of the L.C.C., when Mr. G. H. Hume, chairman of the Highways Committee, made a statement as to its causes.

Mr. Hume said that the trouble arose through a transformer box situated between the generators and the switchboard, and used for the purpose of stepping down the high voltage to the low voltage for the measuring instruments on the board, exploding. This transformer had been in use for ten years, and is the last of its type in the station. Indeed, in another five days it would have been removed altogether. This in itself would not have had serious consequences, but it so happened that in connection with extensions to the switchboard there was a considerable amount of wooden staging near, and the burning oil was thrown out from the transformer box on to this staging, and set the whole of it ablaze. Quite close were the heavy cables running from the generators to the switchboard, and the intense heat naturally destroyed them, and so completely cut the generators off from the switchboard. It is satisfactory to note, however, that the heavy electrical surges thus set up were completely taken care of by the protective devices which were installed after the last accident which occurred at Greenwich, and only those two generators to which this protective apparatus has not been fitted, and which are connected to the reciprocating engines, broke down. These, however, were put right in a very short time. Fortunately no lives were lost, and had the accident occurred five minutes earlier the results might have been very much worse, as at that time there were a considerable number of men on the staging.

Mr. Hume pointed out that the accident in these special circumstances was quite unavoidable, and emphasised that it was in no way due to the fault of the system. At the same time he rendered a tribute to the calmness and the efficiency of the men in the station, who, in spite of the fearful heat, stood to their work and succeeded in putting the fire out long before any aid had been obtained from outside. Night and day work has been continuing since, and it is hoped to have the whole system in full working order by to-day (Thursday). On Tuesday 1,400 cars were running.

A number of questions were put to Mr. Hume by various members of the Council as to the necessity for making arrangements with authorities adjoining the tramway system for a supply in such circumstances, and the Chairman of the Committee testified to the great assistance rendered in the present trouble by, amongst others, the Metropolitan Electric Tramways, Ltd., London United Tramways, Ltd., St. Pancras Borough Council, West Ham Corporation, Leyton U.D.C., Ilford U.D.C., Poplar Borough Council, and the County of London Electric Supply Co. The question of making some permanent arrangements to deal with such emergencies was under consideration. He added that although the tramway load has increased recently the load on Greenwich has not increased, the increase having been met by current taken from outside sources.

The London Electric Supply Corporation point out that the Deptford and Lewisham section of the tramways which is supplied from their Deptford station was not affected, and that they were able to supply increased current to the L.B. & S.C.R. to deal with the additional traffic due to the stoppage of the tramcars.

## THE FUTURE OF LONDON ELECTRICITY SUPPLY

**T**HE Parliamentary Committee of the London County Council has presented a report upon the Bill which has been deposited for next session dealing with the supply of electricity to London and Greater London. We have already given the main details of the proposal, and need only add now that it is suggested that the "Authority" shall consist of 27 members, allocated as follows:—L.C.C., 18; Essex, Hertfordshire, Kent, and Surrey County Councils, 1 each; Middlesex County Council, 2; and the County Borough of West Ham, East Ham, and Croydon, 1 each. It is not essential that all the L.C.C. delegates should be members of the Council, but it is provided that not less than one-half of the 18 shall. The exact boundaries of the area of supply has been slightly modified in order to avoid possible claims for severance in the event of purchase by the Authority. With regard to maximum prices, the figure fixed for railways, tramways, canals, docks, and waterworks is £3 10s. per kw. of maximum demand per annum, plus 0.25d. per unit.

The Bill as drafted contains a proviso that the powers shall lapse if within five years no contract is made between the Authority and a leasing company, but the Parliamentary Committee recommends an alteration so that in that event the Authority shall retain the general powers of control over existing undertakings which are in the Bill in order to assist in the standardisation of supply. The Committee also recommends the deletion from the Bill of the provision defining the duties of the Technical Committee, and substitute merely a power to the Authority to delegate such powers as it thinks fit.

The Hammersmith Electricity Committee recommends that the Bill be opposed, and regrets that the L.C.C. has not held a further conference to give additional information, as was suggested at the Conference held on October 2nd.

On the suggestion of the Wimbledon Corporation, a conference of the Wimbledon, Barnes, Epsom, and Surbiton municipalities is to be held to consider their course of action regarding the Bill. There seems little doubt that they will oppose it.

**Supplies for the Allied Governments.**—All questions relating to the purchase and export of food supplies, munitions of war, and field equipment for the French, Belgian, Russian, and Serbian Governments are now dealt with by the International Commission for the Purchase of Supplies (Commission Internationale de Ravitaillement), the main office of which is at India House, Kingsway, W.C., while the offices of the Russian delegates are temporarily at 192 Cromwell Road, S.W. Application for permission to export goods the export of which from the United Kingdom is prohibited should, if such goods are required by the Allied Governments or their accredited agents, be addressed in writing to the Commission. The Commission will only consider such applications if they are accompanied by documentary evidence as to their official origin, and merchants and manufacturers wishing to supply goods for the use of any of the Allied Governments are warned not to enter into any negotiations until they have ascertained from the Commission Internationale de Ravitaillement that permission for the export of such goods will be granted. Having granted permission to export, the Commission will make the necessary arrangements direct with the Customs authorities for the clearance of the goods, upon receiving from the manufacturer or merchant at least forty-eight hours' notice of each shipment, together with the nature and quantity of the goods, the name and address of consignor and name and address of consignee, the port and approximate date of shipment, the ship or line, the port of discharge, and marks on packages, if any.

**"The Electric Vehicle."**—The first number of the official journal of the Electric Vehicle has just appeared under this title. It is an attractively got-up little publication and contains various articles detailing the satisfactory experiences of uses of electric commercial vehicles in America and this country, and illustrations of a number of types. A description is given of the Edison battery omnibuses running at South Shields, and general notes appear on various aspects of the electric vehicle problem. Details are given of the standard charging plug and garage sign approved by the committee, and some particulars appear of the prices for charging current in different localities. From a detailed list we gather that exactly 100 electric vehicles are now in use or on order in England. The committee have also prepared a set of mail cards illustrating electric vehicles and fleets of vehicles which give some idea of results already accomplished.

**Obituary.**—We regret to record the death of Col. R. K. Birley, C.B., Chairman of Messrs. Chas. Macintosh & Co.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,421.

In the old days the mistake was sometimes made of drawing more than one cable into the same duct. Is there any known method, short of cutting the cable, of finding out whether a concentric cable carrying alternating current, 2,000 volts, single-phase, is "alive" or "dead"?—R. McC.

(Answers must be received not later than first post Thursday, Dec. 24th.)

### ANSWERS TO No. 1,419.

Describe briefly the general design and give particulars of efficiency and working of static balancers for use with 440-volt 3-wire D.C. dynamos, which can be worked either shunt or compound wound, whichever is the more suitable. Two generators will be used of 100 and 50 kw. respectively, both direct-coupled steam sets, running in parallel when the load is heavy; further, for peak loads a battery is also put in parallel. The plant is used for factory driving and lighting. The battery has to be charged during the daytime. State briefly also what extra switchgear and instruments would be required.

The first award is given to "A. G. R." for the reply given in slightly shortened form below:—

An ordinary D.C. machine is fitted with two or more slip rings on the armature, being connected to the winding so as to give single-phase in the case of two slip rings, three-phase with three slip rings, and two-phase with four slip rings. These rings are connected through the brushes to one or more static balancers or balance coils, the mid-point of which provides a mid-point to which the neutral wire of the three-wire D.C. system is connected. Figs. 1 and 2 show diagrammatically the arrangements for an armature with two rings and one with four rings respectively. The static balancer is simply an A.C. transformer with a single winding having a tapping at its mid-point. Since it is connected to an A.C. circuit an alternating magnetising current

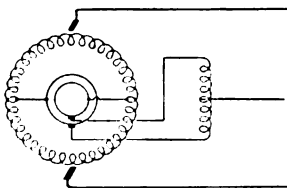


FIG. 1.

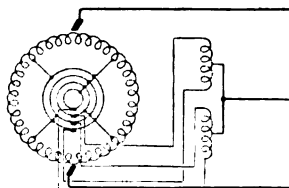


FIG. 2.

flows through its windings, but the magnitude of this current is ordinarily so very small that it may be neglected when considering the flow of direct current from the neutral line to the armature. The designing of these coils presents little difficulty. The alternating voltage at the slip rings will have a frequency equal to the number of pairs of poles  $\times$  speed in revs. per sec. Assuming a sine distribution of flux and taking the case of an armature having two slip rings, the coil must be designed for a voltage of D.C. voltage  $\sqrt{2}$ , and since the currents in the two halves of the winding are equal and flow in opposite directions, they

have no effect whatever in magnetising the core of the balancer, and as the ohmic resistance of the winding can be kept very low, the drop across the coil is usually very small. In designing, this drop is generally limited to about 1.5 per cent. of the voltage across the balancer; this means a low current density and a low copper loss. Where the generator is compound wound, it is usual to divide the series winding into two equal parts, one in series with the positive and the other in series with the negative brush. In this case the compounding will be the same with a load on either side of the neutral wire, but with a certain definite current the series amp.-turns will be twice as great with a load across the outers as with a load between the neutral and the outer. Therefore in high-speed machines the conditions of com-

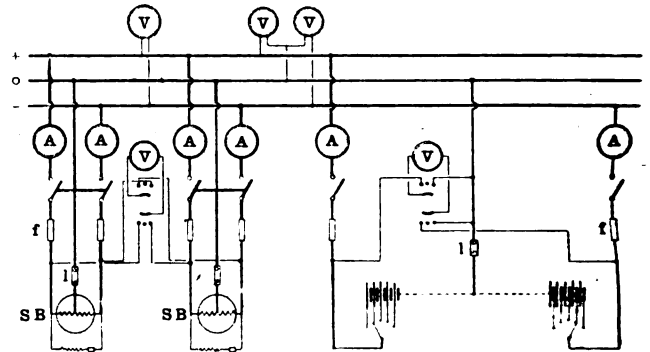


FIG. 3.

A, Ammeters; V, Voltmeters; SB, Static Balancers, connected to generator slip-rings; f, Fuses; l, Links.

mutation may become severe, and it is customary in such cases to limit the unbalanced current to about 10 per cent. of the full load current. In slow-speed machines with more favourable conditions an unbalancing of 25 per cent. is frequently allowed. The efficiency of static balancers, correctly designed, is high, and may often reach 99.8 per cent., but 99.5 per cent. is a good average figure. Fig. 3 shows the diagram of connections required using shunt machines. The only difference with compound is that two equalising connections will be required. Switches and fuses have been included, but these could, of course, be replaced by circuit breakers if desired.

The second award (5s.) is made to "KORL," the principal points in whose reply are given below:—

A static balancer is practically a choking coil, or series of choking coils, connected to points of the winding (via slip rings) in a wave-wound armature  $180^\circ$ ,  $120^\circ$ , or  $90^\circ$  ( $180^\circ$  between the ends of each coil), &c., apart, according to whether a two, three or four-phase, &c., balancer is used. The alternating voltage across the slip rings is of the same dimensions as in a rotary converter, and the middle point of the coils is at a potential half-way between the outers. The design of a static balancer is on similar lines to that of the primary of a static transformer, but that the alternating magnetising current and the ohmic resistance of the windings must be reduced to a minimum from considerations of regulation and efficiency. The direct current in the middle wire is superimposed upon the alternating current, and the construction must be such that the magnetisation due to it is counteracted, otherwise bad regulation and inefficient working will result. This is easily effected in two-phase two slip ring or four-phase four slip ring balancers by winding the coils concentrically, or in sections and interleaving them in such a manner that the direct-current magnetisation is mutually neutralised, it being observed that this current is either to or from the centre of both coils at the same time and is equally distributed in them. In three-phase three slip ring balancers, this arrangement is not possible owing to the odd number of limbs, and it is therefore necessary to wind an extra coil on each limb in series with the middle wire, solely for the purpose of neutralising the direct-current magnetisation. The commutation must be carefully watched, since with an out of balance current there is an unequal distribution in the armature windings with maximum "piling up" in those coils nearest the tappings at the time they are about to be commuted. For this reason an increase in the number of tappings will improve the commutation and also regulation and will reduce the local heating. When the out of balance current is expected to be more than 20 per cent., a four or more phase balancer should be fitted, otherwise a two-phase balancer should be satisfactory, provided, of course, the frequency is not less than 18 to 20 cycles

per second. Dynamos with or without interpoles should have half of all series windings connected on each polarity of the machine, those on one side being on alternate poles, this giving a compounding and commutating pole effect proportionate to the whole load and also improving the regulation. Two equalising leads are therefore necessary for a compound-wound machine which has to work in parallel with others. The regulation obtained with a given out of balance current depends upon the

resistance of the balancer coils, armature, brushes, commutating pole and series winding, the difference between the voltage on the two sides of the system being twice the drop in such of these parts which are on one side of the machine due to the out of balance current. In a well-designed set this should not exceed 3 per cent. to 4 per cent. of the voltage on one side. "Koil" also sends a diagram of the complete switchgear and connections, generally similar to that given in Fig. 1.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Dec. 10th, 1914

A full list of electrical patents published last week appeared in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

23,454/13. **Electrolytic Cleaning.** E. LE R. COUCH. An elaborate apparatus for cleaning articles electrolytically, comprising several vessels containing a special electrolyte through which the articles to be cleaned are passed continuously, by a moving metallic belt with which they make contact. Storage vessels are provided from which the liquid is pumped, and automatically moistened moving brushes effect a partial cleaning before the articles are taken through the electrolytic baths. Steam jets also assist in the cleaning. (Eight figures.)

26,497/13. **Electric Cooking.** A. F. BERRY. Ovens provided with several heaters and fitted with a series of movable baffle plates, which can be set so that the current of heated air either circulates up the middle and down the side of the oven or vice versa. (One figure.)

28,826/13. **Meters.** B.T.-H. Co. and A. P. YOUNG. A.C. meters comprising a cup rotating in the gap of an electromagnet on which the potential coils are wound, and surrounding polar projections carrying the series coils. The magnetic circuit is completed by the side pillars of the instrument, which are provided with adjusting screws of magnetic material to regulate the flux. (Four figures.)

133/14. **Flash Lamps.** F. ESTÈVE. Electric pocket flash lamps supplied by a magneto actuated through gearing by pressure on a lever. (One figure.)

9,840/14. **Telephone Exchanges.** G. A. BETULANDER. A telephone exchange system in which connections are established between a group of subscribers' lines on the one side, and the incoming and outgoing junction lines common to the subscribers' lines on the other side characterised by the division of the group of subscribers' lines into a number of sub-groups, each having at its disposal a number of intermediate lines adapted to make connection with any incoming as well as any outgoing junction. (Ten figures.)

17,487/14. **"Wired Wireless" Telegraphy.** G. O. SQUIER. A system of wave telegraphy or telephony employing a horizontal conductor used for transmitting direct or low-frequency currents by ordinary conduction, such as a telegraph or telephone line, a vertical antenna connected to the receiving end, and a frequency bridge or detector circuit superposed on the line at or near the vertical antenna. (Two figures.)

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.\*

Summaries of some of the more important of these Patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** ST. HELEN'S CABLE & RUBBER Co. and WHITE [Securing cables] 3,323/14 and [Wall junction boxes] 19,192/14.

**Heating and Cooking:** COX [Heating resistances] 26,546/13; HEARSON [Cooking and sterilising apparatus] 26,835/13.

**Instruments and Meters:** EVERSHED & VIGNOLES, LTD., and EVERSHED [Indicating apparatus] 29,545/13.

**Switchgear, Fuses, and Fittings:** CURTIS, PICKETT, COLTON and IGRANIC ELECTRIC Co. [Electromagnetic switches] 26,575/13; HOLOPHANE, LTD., and STROUD [Fittings for shades] 28,498/13; HART [Switches] 8,038/13; CURTIS, MACKLEY and IGRANIC ELECTRIC Co. [Controlling devices] 10,623/14; STORER [Control systems] 17,465/14.

\* It is announced that from Jan. 1st, 1915, the price of printed specifications will be 6d. each, including postage, instead of 8d. as at present.

**Telephony and Telegraphy:** MARCONI'S WIRELESS TELEGRAPH Co. and ROUND [Wireless receivers] 27,480/13; BROWN [Telephonic connections] 29,245/13.

**Traction:** J. STONE & Co. and DARKER [Train-lighting switches] 27,249/13; BIDDLE [Train stops] 27,366/13.

**Miscellaneous:** VON TAGUEFF [Ozoniser] 27,249/13; SMITH [Colliery signals] 28,004/13; GILES [Condensers] 19,868/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Dynamos, &c.:** A.E.G. [Air filters for generators] 22,950/14.

**Electrochemistry:** SOC. GEN. DES NITRURES [Fixation of nitrogen] 22,586/14.

**Incandescent Lamps:** A. B. C. SCHRIFTLAMPEN GES. [Metal filament lamps] 7,591/14.

**Telephony:** GES. FÜR ELEKTRISCHE INDUSTRIE [Prepayment apparatus] 29,645/13.

**Miscellaneous:** SIEMENS & HALSKE A.-G. [Remote control] 22,927/13.

The following Amended Specifications can now be obtained:—

**Colliery Signalling:** J. J. ADLINGTON, 8,975/14.

**Lamp Glowers:** E. PODSZUS, 18,323/13.

### Opposition to Grant of Patents

24,755/13. **Insulators.** F. HANDCOCK. The grant of a patent on this application has been allowed in spite of opposition. The specification describes a tool for boring holes in porcelain insulators during manufacture.

### Application for Revocation

27,664/12. **Car-lighting Dynamos.** BROULT, LTD., B. BROOKS, and W. HOLT. An application for the revocation of this patent has been received. The specification describes a self-regulating dynamo with auxiliary poles carrying a regulating winding connected to additional brushes.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

23,389/00. **Rotary Converter Control.** B.T.-H. Co. (*D. Lunt, U.S.A.*). This specification describes several methods of maintaining constant speed of inverted rotary converters by automatic regulation of the field in response to variations of lag or lead in the current supplied by the machines.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** B.T.-H. Co. (*R. H. Read, U.S.A.*) [Lamps with metallic carbide electrodes] 17,194/01; S. C. MOUNT and BECK FLAME LAMP Co., LTD. [Multiple carbon lamp] 19,387/09.

**Dynamos, Motors, and Transformers:** G. A. MUDGE [Non-sparking pole-tips] 9,554/07; D. DUPONT and HARLÉ & CIE. [Motor control] 17,852/08; B.T.-H. Co. (*G.E. Co., U.S.A.*) [Rotary converters] 18,053/08.

**Electrochemistry and Electrometallurgy:** H. PAULING [Electric furnaces] 18,901/07.

**Ignition:** R. BOSCH [Electromagnetic sparking plugs] 30,049/09.

**Instruments and Meters:** S. Z. DE FERRANTI and W. HAMILTON [Meters] 18,766/02.

**Switchgear, Fuses, and Fittings:** J. A. KENNEDY-McGREGOR and H. WREN [Switches] 18,317/04.

**Telephony and Telegraphy:** A. POLLAK [Relays] 19,282/07; SIEMENS BROTHERS & Co., LTD. [Order telegraphs] 19,684/09.

**Traction:** B.T.-H. Co. (*G.E. Co., U.S.A.*) [Single-phase motor control] 19,120/06; W. M. HERD and A. ESPLEN [Electric carriage locks] 19,264/07; W. A. STEVENS [Control of petrol-electric vehicles] 17,822/08; SIEMENS BROS. & Co., LTD. (*Siemens & Halske A.G.*) [Switches for railway signalling] 19,662/09.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

The Annual Report of the Postmaster-General for the year ended March 31st, 1914, records an increase of 108 in the number of telegraph offices, which was then 14,152. The total number of telegrams transmitted shows a slight decrease, but was over 87,000,000. This is explained by the growth of the telephone system. The telephone has replaced the telegraph at many offices where the traffic is light. Improvements are being made with high-speed apparatus. The Gell perforator, and the Creed reperforator and printer, are being more extensively used; a new Siemens' instrument is being tested, sextuple working has been applied to the Baudot apparatus between London and Birmingham, and Quadruple duplex sets are to be installed between London and Liverpool and between London and Glasgow. A new form of Murray multiplex apparatus is also being worked experimentally between London and Manchester. Among the extensions of the underground system it is mentioned that the lines from London to the landing places of the French, Belgian, Dutch, and German cables are now all underground. By means of "phantom" circuits a certain amount of telegraphy is now carried out over telephone circuits. Several circuits, especially in Scotland, are equipped in this way for emergency use. There has been considerable amplification of the coast communication system. It is needless to quote from the report as regards foreign telegraphs, as there has been much rearrangement owing to the war since the report was written.

With regard to wireless telegraphy, the report refers to the coming into force of the International Convention in July, 1913, and states that 879 British ships carried wireless installations under licence from the Post Office, as compared with 646 a year before. New stations have been opened at Land's End and Fishguard, replacing those at the Lizard and Rosslare. The stations at Malin Head and Niton have been transferred to new positions in the neighbourhood, and new stations are recorded as being nearly ready at Valencia and Guernsey. The projected station at Stonehaven is also mentioned. The progress of the stations forming the Imperial wireless chain is summarised. Sites have been acquired for the sending aerial at Leafield, near Oxford, and the receiving aerial at Bishop's Cannings, near Devizes, and the erection of the masts is in hand. Sites have also been selected in Egypt at Abu Zabal, near Cairo, and Abu Sueir, near Ismalia. The Indian Government are proceeding with arrangements for erecting aerials in the neighbourhood of Poona. Sites have also been provisionally selected in East Africa near Nairobi, and in the Transvaal. Provisional steps have been taken for the selection of sites in the Straits Settlements.

The number of telephones belonging to the Post Office is given as 774,821, and 184 new exchanges were opened during the year, bringing the total up to 2,831. In London, twenty of the National Telephone Company's exchanges were replaced by new exchanges in new buildings. In addition, preparations had been nearly completed for opening the "Museum" exchange, and sites have been obtained for three other large

exchanges in the East Central and West Central districts. New underground cables were commenced between London and Brighton, Glasgow and Edinburgh, Newcastle and Sunderland, Cardiff and Swansea, Barnsley and Sheffield, and other centres. In December a telephone cable was laid from Carnarvonshire to Dublin Bay. This, about 72 miles long, is the longest submarine telephone cable in the world, and will afford three and possibly four additional channels of communication. Automatic telephone exchanges are being constructed at Newport (Mon.), Darlington, and Hereford, and are about to be commenced at Accrington, Chepstow, Dudley, Grimsby, Paisley, Portsmouth, Leeds, and Stockport. Arrangements have also been made for a trial of automatic equipment of a type which is intended for use in small exchanges in country districts.

A brief account of the short-distance wireless telephone apparatus with which Mr. Marconi is reported to have made successful experiments between ships of the Italian Navy recently, is given in the *Wireless World*. The combined transmitting and receiving set weighs 59 lb. The transmitter is a specially constructed "Marconi oscillation valve," shunted with a resonating system of condensers and inductances from which continuous oscillations are produced of a frequency controlled by variable ebonite condensers. This system is inductively coupled to the aerial of a variable coupling. These continuous oscillations of constant amplitude produce no sound in the receiver until the variations required for transmitting speech are made by the microphone. The microphone can be at any distance from the transmitter. The filaments of the transmitting valves are supplied at low pressure by an 80 ampere-hour accumulator, and the E.M.F. applied to the vacuum of the valve is supplied by a dry battery consisting of five cases of cells and giving 500 volts; only about 10 to 20 milliamperes is required. The receiver consists of an oscillation valve and crystal set of high sensitiveness. The set can be also used for continuous-wave telegraphy with suitable aeralis up to 100 miles range.

The Portuguese telegraph authorities have put into force Rule 8 of the Telegraph Convention, and have prohibited for the time being all traffic between Fayal, Azores Islands, and North America *via* the cables of the Deutsch Atlantische Company.—The Singaradja-Amperon cable is down.—Telegrams for Lombok Island are sent by post from Soerabaja, Singaradja, or Makasser.—The Russian Administration states that all telegraphic intercourse with Turkey is suspended.—Radio-telegraphic communication between Bari and Antivari is interrupted.—Persian lines Behbahan-Ahvaz-Mohammereh restored.—The Japanese Government state that restrictions regarding private telegrams in force on August 21st last are substituted by the following: Senders or receivers of telegrams must furnish on demand explanatory notes in Japanese, English, or French with telegrams or the codes if necessary.

It is announced that, owing to the war with Turkey, the half-year's interest due on January 1st next on the 6 per cent. Obligation Bonds of the Constantinople Telephone Co. must be postponed. It is stated, however, that the telephone service in Constantinople is still being maintained under the direction of the British staff.

## "ELECTRICAL ENGINEERING" TRADE SECTION

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**COOKING APPLIANCES.**—A collection of leaflets describe the latest designs of several pieces of cooking apparatus, separate heating discs, &c., manufactured by Ferranti, Ltd. (Central House, Kingsway, W.C.). Particular attention may be called to the substantially built electric ovens and complete cookers, of which several new forms appear.

**INCANDESCENT LAMPS.**—A list from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.) deals with all classes of Robertson carbon filament lamps both for lighting and radiators. These lamps are made at the Robertson Lamp Works at Brook Green, and the bulbs are blown at the company's glass works at Lemington-on-Tyne. Owing to the increased cost of manufacture, a slight rise has been necessitated in the cost of lamps in coloured glass bulbs.

**HEATING AND COOKING APPARATUS.**—We have received from the Western Electric Co., Ltd. (North Woolwich), a leaflet describing a circular open coil flat electric stove, which is suitable

for toasting, frying, boiling, or grilling. The apparatus appears strongly made, and the same applies to an electric iron listed in the same leaflet.

### A LUMINOUS HELM INDICATOR

A NEW piece of apparatus put on the market by Siemens Bros. & Co., Ltd. (Woolwich), is an indicator which shows by means of illuminated windows of different colours when the rudder is amidships, and when hard over to port or starboard. The instrument serves as a check on the accuracy of the telemotor or other controlling gear, and is of simple construction. The indicator on the bridge or in the wheel-house consists of a teak case provided with three windows, the centre one fitted with white glass which is illuminated when the rudder is amidships, whilst the side ones are fitted with red and green glass respectively for indicating when the rudder is hard over. Lamps are mounted behind the windows, and are switched on and off by means of the transmitter fixed near the rudder post, and connected to it by means of rods. The current required for the lamps is taken from the lighting circuits of the ship or from batteries. The transmitter is mounted in a watertight case, and is of strong construction.

## A NOVEL ELECTRIC SIGN



WE illustrate here an electric sign which Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston, N.E.), have recently completed to an order received through their Singapore branch. The sign is 14 ft. long by 2 ft. 8 in. wide and 1 ft. deep, and is to be fixed from the roof of a very lofty store. The local regulations prohibit the fixing of a sign which projects more than 3 ft. deep, and it was therefore necessary to arrange the advertising matter on the sign to read vertically. The Chinese characters lend themselves to this style of design, and the top three, which are visible day and night, represent the name of the store. This lettering changes in colour, red, yellow, and green in succession, when illuminated at night time, with a complete blanking-out in between the different colours. Each of the remaining panels advertise some article manufactured by the store, and they figure on the sign in rotation in the same colour as the name of the firm appears, so that with each change of colour in the name there is a change of advertisement on the sign itself. These lower panels appear absolutely blank in the day time. The wavy beaded border is arranged on the chasing flasher basis—two sections of twelve beads, that is, two lengths of approximately 18 in. are blanked out mechanically in succession all round the border. In order to obtain the results described, about thirty distinct lamp circuits had to be wired, and the number of Wotan lamps employed is about 150. These have been varnished by the Siemens process, in order that they will satisfactorily withstand the weather conditions. The flasher is of the motor-driven pattern and controls the main panel circuits and the border. The sign is double-sided, with similar panels on each side. It is finished black stove enamel outside and white inside.

## TRACTION LAMPS

WE have received from the Edison & Swan United Electric Light Co., Ltd. (Ponders End, Middlesex, and 123-125 Queen Victoria Street, E.C.), some particulars of the metal filament lamps which they have specially designed for use for shipping, railway, tramway, and similar work where the conditions demand a stronger lamp than usual. The filaments are of pure drawn tungsten wire, and the design permits of short lengths being used, thus ensuring



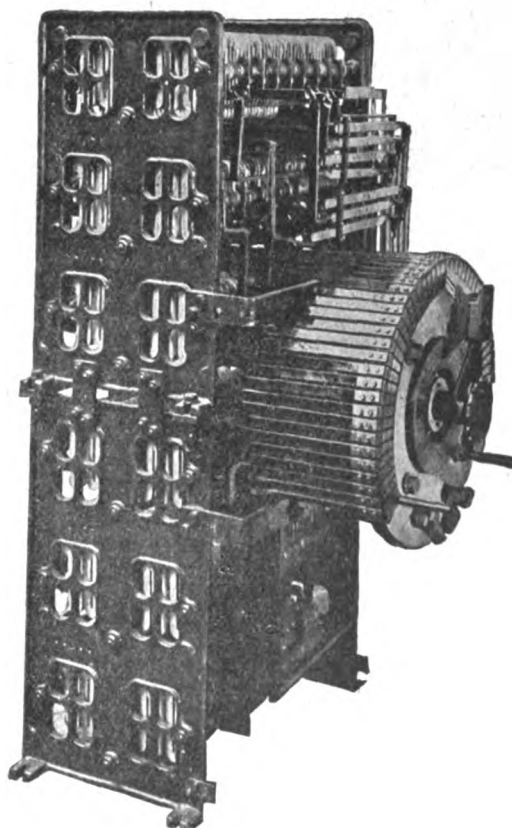
METAL FILAMENT  
TRACTION LAMP.

the necessary rigidity and strength. The standard type of lamp for electrically-propelled trams and trains measures 4 in. overall, 2½ in. diameter; is in the popular pear-shaped bulb, and rated at 100 volts 30 watts, this small size being convenient to save headroom, and is suitable for all standard fittings. For cases of lighting railway carriages from dynamos and accumulators on any of the well-known systems, a smaller bulb is used, round in shape, and with the glass pip or seal point concealed in the collar. This lamp measures 2½ in. long overall, and bare 2 in. diameter. Great care is taken in the manufacture of the lamps, the wire is specially selected, and the glass stems supporting the wire are made stronger than in the usual type. In this connection it may be mentioned that motor-car head and side lamps and motor-car and omnibus lighting lamps are also a speciality of the Company, who have for many years been the manufacturers

of the C.A.V. motor-car lamps. In the former case, to get a good focussing effect, and incidentally to get the filament into as small a bulb as possible, the filament is wound in the form of a double helix, giving it great strength and resistance to shocks and vibration. For lighting purposes small lamps are used, in some instances what is known as the festoon type, with the wire in a tubular bulb with a terminal at each end, and in other cases a lamp with a small round bulb, from 1¼ in. to 1½ in. diameter, is made for running off a small accumulator set. The lamps are made throughout, from the glass bulb to the lamp collar, entirely at the Ponders End Works of the Edison & Swan Co., a firm entirely British as to shareholders, directors, staff, and employees.

## ALTERNATOR REGULATORS

THE General Electric Co., Ltd. (Witton, Birmingham, and 67 Queen Victoria Street, E.C.), manufacture a number of different patterns of regulator for controlling the exciting current of large generators. Their rectangular type, with strip resistance, has been described in *ELECTRICAL ENGINEERING*, but the accompanying illustration shows a quite different pattern, supplied to a municipality for the control of a 5,000-kw. turbo-alternator. It consists of a circular face-



VIEW OF REGULATOR, WITH COVER REMOVED TO SHOW CONNECTIONS.

plate regulator of extremely strong construction, mounted on the same angle-iron framework as a cast alloy "grid resistance." The connections between the contacts and the resistance are of solid copper bar; the regulator contacts are turned round at right angles and the copper rods are screwed to them, so that there are no loose wires.

**Installation News.**—The attractive little magazine of this name issued by Simplex Conduits, Ltd. (116 Charing Cross Road, W.C.), has reappeared in amplified form as the first issue of a new series. It contains some brightly written notes and comments on the present situation and illustrated articles on novelties recently introduced by the firm. Some excellent suggestions are made regarding electrical Christmas presents.

**The Strength of Metal Filament Lamps.**—The Edison & Swan Electric Light Co., Ltd. (Ponders End, Middlesex, and 123-125 Queen Victoria Street, E.C.), send us a copy of a letter from the Front describing a house which had been heavily shelled by the enemy where an Ediswan lamp was still hanging from the ceiling perfectly intact, although almost every other thing in the house had been smashed in some way.



## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Altrincham.**—An inquiry was held last week concerning a loan of £675 for street electric lighting. Mr. H. R. Hooper, the L.G.B. Inspector, suggested that incandescent gas lighting would have been more advisable, and commented upon the unbusinesslike policy of the Council in not having detailed figures available. The Council is to give further consideration to the scheme.

**Bacup.**—The Council requires a 100-kw. and a 50-kw. transformer.

**Greenock.**—The Electricity Committee proposed to borrow £90,000 for extensions at the electricity works.

**Middleton.**—A loan of £273 is to be taken up for electricity purposes.

**Newcastle-under-Lyme.**—Sanction to a loan of £1,350 has been received for cables and storage battery.

**South Africa.**—A complete electrical installation is required by the Mossel Bay municipality. Further particulars at 73 Basinghall Street, E.C. Jan. 12th, 1915.

**Wednesbury.**—An inquiry has been held regarding a loan of £2,146 for a transformer station, rotary converter, cables, &c., in connection with the bulk supply from the Midland Electric Corporation for the King's Hill district.

**Weymouth.**—A loan of £2,100 has been sanctioned in respect of new generating plant.

### Wiring

**Ayr.**—Electric lighting at the Heathfield Hospital.

**Cardiff.**—King George Buildings. Architects, I. Jones and S. Thomas, 6 & 7 St. John Square.

**Penistone.**—Lighting of workhouse.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Chesterfield.**—Two schools, £11,844.

**Newcastle-on-Tyne.**—Additions Bath Road School, £5,870.

### Miscellaneous

**Sunderland.**—Six months' supply of electrical stores for the Guardians. Clerk, 17 John Street. Dec. 28th.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**Barrow-in-Furness.**—The tender of the British Thomson-Houston Co. has been accepted for a 2,000-kw. turbo-alternator with condensing plant at £6,718.

**Dewsbury.**—The tender of the Union Cable Co. has been accepted for cable.

**Torquay.**—An offer by the British Thomson-Houston Co. to supply a turbo at £3,837, condensing plant at £1,247, and rotary converter at £1,163, prices slightly higher than were charged for similar plant already installed, is recommended for acceptance.

**Uxbridge.**—The Uxbridge Electric Supply Co. has received the contract to instal electric driving at the sewage works.

**Fire at the Edison Works.**—The recently reported fire at Mr. T. A. Edison's headquarters, where the works of several of his concerns are situated, affected only the phonograph departments. We are informed by Edison Accumulators, Ltd. (2 and 3 Duke Street, Piccadilly), that the remainder of the buildings and machinery are intact, including those devoted to the Edison storage battery, which are working to their full capacity of 3,000 cells per day.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £61 10s. to £62 (last week, £58 10s. to £59.)

**Canadian Agency.**—A Montreal agent desires to represent British makers of tungsten lamps and electrical fittings.

**Change of Address.**—On and after Dec. 24th the address of Scholey & Co., Ltd. (now of 151 Queen Victoria Street, E.C.), will be 56 Victoria Street, S.W. (Telegrams, Scolanco Sowest London; telephone, Victoria 6663, two lines.)

## APPOINTMENTS AND PERSONAL NOTES

By the will of the late Mr. Augustus Stroh, the Building and Benevolent Funds of the Institution of Electrical Engineers will benefit to the extent of £250 each.

Alderman John Brown, who has played such a conspicuous part in the development of the Hull municipal telephone service, has been presented with a "Telephone Testimonial," consisting of a grandfather clock.

Mr. T. P. Walsh, switchboard attendant at the Dewsbury Electricity Works, has resigned. Mr. R. P. Jones has been promoted from switchboard attendant to shift engineer.

The Ipswich Electricity Department requires a draughtsman; and particulars are given in our advertisement columns of vacancies for switchboard attendants, wiremen, and a works electrician.

## LOCAL NOTES

**Bolton: Competition between Departments.**—The Electricity Committee having secured the work of lighting certain streets after competitive tenders with the Gas Department, the representatives of the latter on the Corporation suggest, as has been done elsewhere, that there should not be competition between departments. The scheme is to proceed.

**Move: Electricity Charges.**—The Council has decided to reduce the charge for current for power purposes from 2'13d. to 1'5d. per unit. Some adverse comment is being made locally of the decision not to reduce the charge for private lighting until the existing plant has been superseded by more modern plant. It is pointed out that Sir Alexander Kennedy, in his report to the Council, recommended a reduction of ½d. per unit all round, making the price for lighting 4'75d. and for power 1'63d. per unit.

**Liverpool: New Generating Plant.**—A new 8,000-kw. three-phase 6,000-volt turbo-alternator was started up at the Lister Drive power station last week.

**Sheffield: Dispute with Wiring Contractors.**—The Council has discussed in Committee the charge by the local wiring contractors that the Electricity Department is continuing to trade in wiring and fittings contrary to the Corporation Act of Parliament. The Committee argue that the contractors wish to negotiate on the basis that the Council's trading department should be closed down, which, it contends, is quite contrary to the clause in the Act. They suggest a scheme whereby fittings may be sold through a contractor, and also recommend that the show-room and department be continued. This was passed, but the contractors are threatening to take the matter to the law courts again.

**Southport: Street Lighting.**—Owing to the shortage of carbons, the Electricity Committee recommended the Corporation to discontinue the whole of the street arc lighting until further notice. There was naturally some considerable discussion upon this, and it was eventually decided to discontinue the arc lighting on the promenade and to reduce the rest of the electric lighting in the borough by one-half.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 417 [VOL. X., No. 51]  
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THURSDAY, DECEMBER 24, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

Small prepaid Advertisements for SITUATIONS VACANT AND WANTED, ARTICLES FOR SALE AND WANTED, &c., are inserted at the rate of One Penny per word, minimum One Shilling, three insertions for the price of two.

OFFICIAL NOTICES AND TECHNICAL COLLEGE ANNOUNCEMENTS are inserted at the rate of Ninepence per line (column width).

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

DURING the bombardment on the East coast last week, seven men were killed at Richardsons, Westgarth's works at Hartlepool, and the Secretary of the Scarborough Electric Supply Co. was killed at his house. The electricity works at Hartlepool, Scarborough, and Whitby escaped injury (p. 646).

WE draw attention to the effect which the Long Eaton judgment with regard to preferential charging is having upon certain other supply undertakings (p. 646).

RESULTS of tests of the Oerlikon turbo-alternators at Marylebone show remarkable figures of steam consumption (p. 646).

A NEW 6,000 kw. B.T.-H. turbo-alternator has been started-up at the Liverpool Electricity Works (p. 647).

THE protection of the low tension side of transformers from accidents due to high voltage is discussed in our "Questions and Answers" columns (p. 648).

THE lighting of the camps for the two battalions raised by the Glasgow Corporation was switched on last Monday. There are in all about 1,100 lamps. The order for the lighting was only given on Nov. 15th (p. 649).

WE give a few details of the activities of the Association of Supervising Electricians (p. 649).

SEVERAL technical books are reviewed on p. 649.

AMONG the subjects of specifications published by the Patent Office last Thursday were heating elements, wireless telegraphy, telephone connections, and train

control. A patent for helical lamp filaments is opposed. A patent for an electric number sign expires this week after a full life of fourteen years (p. 650).

A NEW form of thermal telephone was shown in London recently. Prof. Howe gave a lecture before the Wireless Society of London on high frequency resistance last Friday. The use of high speed printing telegraph apparatus is rapidly increasing (p. 651).

WE give some notes on the steps taken to reinstate the supply after the accident at Greenwich. This occurrence has been made the occasion of a political attack in the Council.—Cab signalling on locomotives has been discussed by the Institution of Mechanical Engineers (p. 651).

OUR Trade Section contains descriptions of British-made outside lanterns, new glassware, and an arc lamp carrier (pp. 652-653).

MAINS, services, and meters are required at Bethnal Green and Hampstead; mains at Wolverhampton; new plant at Huddersfield (£20,000); engine and boiler plant and switchgear at Bolton; and transformer testing apparatus at Sydney (p. 645).

THE L.C.C. Finance Committee has refused to grant forty-two years for a loan for mains at Bethnal Green, but the dispute with the St. Pancras Council as to reducing the existing forty-two year periods on that undertaking has been settled in favour of St. Pancras.—The Hampstead Council is contributing towards the cost of the Ilford preferential charging case (p. 645).

**The Electric Vehicle Committee.**—At a recent meeting of this committee it was decided to make another effort to bring all electric-supply undertakings into line in regard to a flat rate of 1d. per unit for the supply of electric energy for charging vehicle batteries at times other than those during "peak" load, and to approach those undertakings which had adopted a high minimum charge with a view to their reducing it to a figure more near to that which the committee recommended. The matter of standard rim diameters for vehicle wheels was discussed, and it was decided to support the efforts which are being made by the Motor Manufacturers and Traders' Association to get certain diameters standardised for this purpose. In regard to membership of the committee, it was decided that the present members should hold office until March 31st next, when they may be re-elected by the bodies which they represent. It was decided to ask the British Electrical Federation, Ltd., to nominate a representative on the committee. As to methods of charging electric vehicle batteries, it was decided to point out to the battery makers that the most convenient method of charging, from the charging station point of view, is that which is carried out at constant potential and automatically tapering current, and to ask the makers how far they can supply batteries to comply with this requirement. As to lamps for use on electric vehicles, it was decided to confer with the Tungsten Lamp Association with a view to getting certain sizes standardised for this purpose. The final revision of the specification for the charging plug and receptacle was completed. It was decided to recommend that where the charging current required by a large vehicle exceeds the safe current-carrying capacity of the plug and its charging cable, two plugs and connections should be used in parallel.

## THE EAST COAST BOMBARDMENT

THE following is an extract of a letter received from Mr. H. F. Friederichs, the Borough Electrical Engineer of West Hartlepool:—

I am glad to say we got off scot free, and considering the number of 4-, 6-, and 12-inch shells fired during the fifty minutes' bombardment, I think the damage all round was very small. If the enemy's marksmanship had been better our sufferings would have been truly appalling. Shells which fell in the roads and footpaths left our cables exposed in many places, but, wonderful to relate, they were all undamaged; not a single pane of glass was damaged at either power station or sub-stations, yet shells were bursting all round.

The tramways suffered most—the office at the dépôt had the roof and a couple of rooms wrecked, and the clerk there at the time was rather badly knocked about, and a few cars were also damaged. The overhead lines between the Hartlepoons were knocked down in two or three places, and also on the Park Section. Our Tramway Manager, Mr. Burgess, has his hands full now repairing in order to cope with the traffic; everyone is cooling down and sight-seeing, and added to them are visitors from afar.

I suppose the whole affair was so sudden that people forgot to switch off their motors, heating and cooking apparatus, and lights (it was a dull, foggy morning); anyhow, the switchboard showed the usual load, and I really did not like to give the order to shut down and clear out or hide for safety, as a shut down might only add to the discomfort of those who had hidden themselves in any dark corner or place of safety, so we kept running all the time. I think my lads all deserve the V.C. for sticking it, for if they were not thinking of themselves, they were of their wives and kiddies at home.

Mr. D. B. Morison, the Managing Director of Richardsons, Westgarth & Co., Ltd., whose works are on the coast, writes us:—

Unfortunately, seven of our men were killed, but the damage to the works is trifling, and we shall be in full swing again on Monday [Dec. 21st]. All the staff escaped, but had the bombardment been half an hour later the consequences might have been serious, as the offices were badly peppered with shrapnel.

[A subsequent letter received from the company states that the actual damage was confined to the partial destruction of a few roofs and a great number of broken windows. No work in progress or machines were injured.]

From Mr. J. W. Piggott, Electrical Engineer to the Whitby U.D.C., we have the following report:—

I am glad to say that our station, which was in a direct line of the firing, received no damage. The only damage we suffered was the blowing over of two lamp-posts.

Mr. F. G. Holden, Resident Engineer of the Scarborough Electric Supply Co., Ltd., writes:—

Our station escaped all damage, except for a certain amount of glass being broken by concussion of explosion of shells in the vicinity. None of the network has suffered, except that the overhead wires of the tramways company has been brought down in several places in the town. Our Secretary, Mr. John Hall, was killed by a shell which exploded at his residence. Being a prominent citizen, with active municipal and magisterial interests, he will be much missed in this his native town.

## PREFERENTIAL CHARGING

THE Long Eaton judgment on the question of preferential charging, which held that a consumer cannot be given a special discount because he uses electricity solely for either lighting or power, or both, is having an echo in various parts of the country. We have already, on several occasions, referred to the Ilford case. It will be heard early in January, and as municipalities all over the country are subscribing funds towards meeting the cost of the defence, it is apparently thought that there are circumstances in the case which differentiate it from Long Eaton.

The South London Electric Supply Corporation, according to their tariff, were willing to supply consumers, not using gas, at  $\frac{1}{2}$ d. per unit less than consumers who did, and even before the Long Eaton case was heard, the South Metropolitan Gas Co. challenged the legality of the offer. At first the case was to be fought, but the Long Eaton judgment compelled the South London Electric Supply Corporation to abandon the defence, and before Mr. Justice Eve in the Chancery Division last week the gas company applied for judgment. The only point, then, was whether the Gas Co. should have an injunction or, as in the Long Eaton case, a declaration that the offer was a breach of Sections 19 and 20 of the Electric Lighting Act of 1882. Mr. Justice Eve granted a declaration.

The Electric Supply Corporation, which supplies in a large number of towns in England and Scotland, have also, in consequence of the Long Eaton decision, withdrawn a 10 per cent. rebate granted to customers using electricity for lighting throughout their premises.

## TURBO-ALTERNATOR TESTS AT MARYLEBONE

THE two 3,000-kw. Oerlikon turbo-alternators which formed the first instalment of A.C. plant at the Marylebone Electricity Works, and were described in an illustrated article in ELECTRICAL ENGINEERING (Dec. 4th, 1913, page 675), were remarkable as being among the first machines of such size in this country to run at as high a speed at 3,000 r.p.m., and it is interesting to give some of the test figures of steam consumption which have been attained, and are remarkably low.

The two machines gave their normal load of 3,000 kw. at 6,660 volts three phase 50 cycles normal load, with a temperature rise not exceeding 54° F. after six hours, and their overload capacity of 4,200 kw., with a temperature rise not exceeding 81° F. after six hours. The following are the steam consumption in lbs. per kw.-hour, guaranteed and realised on test for a steam pressure of 190 lb. per square inch, and steam superheated to 485° F., with a 95 per cent. vacuum:—

	Set No. 1.	Set No. 2.	Guaranteed.
Full load .....	12'88	12'92	13'27
Three-quarter load .....	13'04	13'21	13'73
Half load .....	14'00	14'05	14'70

Mr. A. H. Seabrook has expressed great satisfaction with the economy of the sets, and from some output figures for the station that we have seen it is evident that they are taking a large portion of the load. The tests were so satisfactory that the Oerlikon Co. have had no objection to the raising of the allowable overload somewhat and increasing the steam temperature by another 100° F.

**The Effect of Vacuum on Steam Turbines.**—In a paper read recently before the Institution of Mechanical Engineers, Mr. G. G. Stoney, F.R.S., reviewed the question of the relation between vacuum and efficiency in steam turbines. He showed how the degree of vacuum which gave the same velocity ratio at the exhaust end as throughout the turbine was the vacuum under which the best results were obtained. Consequently a turbine designed for 29 ins. vacuum required more rings of blades than one for 27 ins. The percentage gain due to vacuum depends on the steam conditions much more with low pressure than with high-pressure steam, but the gain in B.Th.U. available was almost independent of the steam condition. From tables given in the pages it appeared that whereas the gain in economy between 24 and 25 ins. was 3 per cent. for certain h.p. steam conditions, and 10 per cent. for low-pressure steam, it was 13 and 27 per cent. respectively between 29 and 29½ ins. at full load. There were practical limitations to the velocity of the blades at the exhaust end, but these still left a gain of 6½ per cent. between 28 and 29 ins. It was the aim of designers to increase the limiting vacuum by using higher blade speeds and enabling an exhaust end of larger dimensions to be employed. At fractional loads the gain due to high vacua was even more marked, the more so with throttle than with nozzle governing. An increase of vacuum was, however, associated with a lower temperature of the condensate, but even at the highest vacua there is usually sufficient exhaust steam from the auxiliaries to raise the condensate to a temperature suitable to the economisers. The cost of obtaining a high vacuum due to size of condensers and quantity of cooling water required was also considered. The most economical conditions in power stations were usually to have a vacuum of about 29½ ins. with 50° F. cooling water and circulating water 65 times the steam condensed, and 28 ins. at 80° with 70 times further increased in the quantity of cooling would need pumps of disproportionately greater size.

**German Trade in Belgium.**—British manufacturers desiring to make arrangements for being represented in Belgium in the future are invited to apply to the Belgian Chamber of Commerce in London (24 St. Dunstan's Hill, E.C.), who have the names of a number of good-class refugees who, before the war, acted for German firms, and are wishful to replace these makers by English manufacturers of similar goods. Employers who have vacancies for foreign correspondents, &c., are also invited to communicate with the Belgian Chamber of Commerce.

**The Society of Engineers.**—At the annual meeting on December 14th, among the awards announced was the President's gold medal to Mr. A. S. E. Ackermann, for his paper on "The Utilisation of Solar Energy." The following officers and council were elected for 1915:—President, N. Scorgie; Vice-Presidents, P. Griffith and H. C. Adams; Members of Council, H. Adams, C. T. Walrond, S. Cowper-Coles, B. H. M. Hewett, F. H. Hummel, G. A. Becks, F. L. Ball, W. B. Eason, G. O. Case, and W. N. Twelvetrees; Associate Member of Council, C. E. May; Hon. Secretary and Hon. Treasurer, D. B. Butler.

**Royal Institution.**—Among the Friday evening discourses before Easter will be one by Dr. Dugald Clerk, F.R.S., on "Gaseous Explosions"; on Jan. 29th, one by Prof. A. W. Crossley, F.R.S., on "Science and Industrial Problems," and one by Prof. Sir J. J. Thomson, F.R.S., on "Experiments in Slow Cathode Rays."

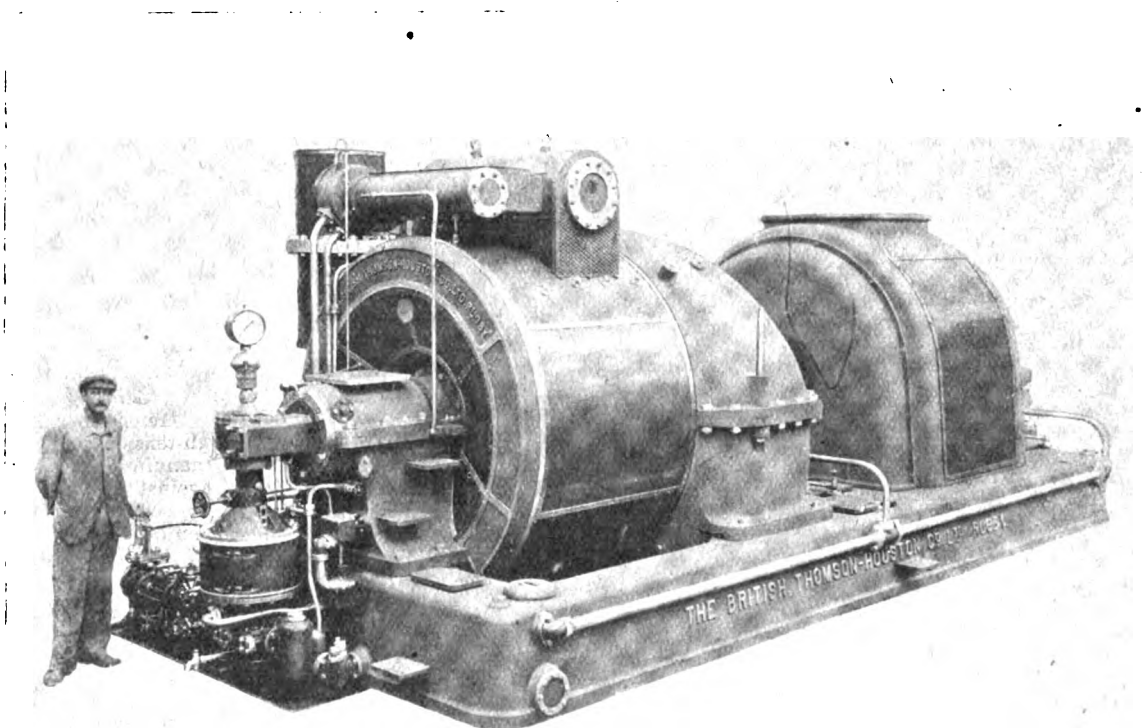
## NEW 6,000-KW. TURBO-ALTERNATOR AT LIVERPOOL

A NEW 6,000 kw. steam turbo-alternator has been "inaugurated" at the Lister Drive station of the Corporation of Liverpool, and is the largest set in the works. The opportunity was taken to inspect the whole generating plant, and the ceremony of starting the new set was performed by the chairman of the Electricity Committee in the presence of the Lord Mayor of Liverpool and a large company who afterwards dined together at the Adelphi Hotel.

The new set is of entirely British manufacture, and was built and supplied by the British Thomson-Houston Co., Ltd. (Rugby), whose contract also included the supply of the condensing plant, manufactured by the Mirreles Watson Co., Ltd. (Glasgow). The Corporation has at the present time another similar set on order, and the station has been altered so as to accommodate two more similar sized sets. When completed the capacity of the No. 1 station will be 35,000 kw., made up of two 2,000 kw. Westinghouse D.C. turbo-generators, two 3,500 kw. B.T.-H. turbo-alternators, two 6,000 kw. B.T.-H. turbo-alternators, and two 6,000 kw. sets not yet ordered. In the No. 2 station are installed four 2,000 kw. Westinghouse turbo-sets and six 2,000 kw. Curtis

valves which open and close successively. The oil pressure for the controlling piston is obtained from the lubrication system. An arrangement is provided by which the speed may be adjusted by hand 5 per cent. above or below the normal rated speed while running. The governing is within  $2\frac{1}{2}$  per cent. total variation between no-load and full-load, and the momentary variation in speed when full-load is thrown on and off is 5 per cent. A safety governor is also provided consisting of an unbalanced steel ring held by means of a helical spring concentrically to the turbine shaft as long as the speed of the shaft remains normal. Should the speed exceed  $12\frac{1}{2}$  per cent. above normal speed, the centrifugal action will overcome the spring and cause the ring to fly over into an eccentric position. In this position it will strike a trigger and thereby allow the emergency valve to close. This valve can also be operated by a hand-tripping arrangement.

The alternator has a cast-iron stator frame all in one piece provided with removable inspection panels. The stator core plates are insulated on both sides with a hard enamel. High tensile steel discs are used for the rotor. The machine is provided with double end shields, and air is drawn in between them from the space below the base plate. This ventilating current divides into two parts—the first part is drawn in through the rotor, and by means of the ducts provided ensures



6,000-KW. B.T.-H. TURBO-ALTERNATOR AT LIVERPOOL.

vertical B.T.-H. sets. The stations are under the charge of Mr. H. Dickinson, City Electrical Engineer, who is responsible for the arrangements of the extensions.

The turbine driving the new sets is of the horizontal shaft type, running at 1,500 r.p.m., and is designed to take steam at 200 lbs. per sq. in. superheated 200 deg. F., and to exhaust into a 28-inch vacuum. The normal rated output of the set is 7,500 k.v.a. at 80 per cent. power factor, 6,600 volts, three phase, 50 cycles, for six hours with a temperature rise not exceeding 40 deg. C. (with intake air not above 25° C.). The overload capacity is 25 per cent. at 80 per cent. power factor for two hours, and the alternator is specially designed to withstand a short circuit with the minimum amount of mechanical strain. Among interesting points in the design of the turbine are the use of carbon ring steam sealed glands, the completeness of the forced lubrication system and the governing arrangements. The governor is driven by worm gear from the main turbine shaft. It is of the centrifugal type, and is carried on the same vertical shaft as that driving the oil pump. It controls a small hydraulic pilot valve which admits oil at a pressure of about 60 lb. per sq. in. on either side of a rotary piston attached to the cam shaft which operates the steam-controlling valve. This admits steam to a small group of nozzles with several controlling

that the exciting windings are thoroughly cooled; the other portion is impelled against the stator and windings by means of carefully designed fans fitted to the ends of the rotor. The air which escapes from the rotor also passes through these same ducts, but by means of separate channels, so that the two streams of air do not in any way interfere with one another. A large opening is provided at the bottom of the stator frame, which allows the air to pass out into the exit duct, or it can be led off into the engine room by means of an opening in the top of the stator frame. The hot air leaving the machine may be conducted to the stoke hold so that some portion of the energy lost in the generator may be recovered in the boiler plant. The quantity of air needed for cooling the generator amounts to about 25,000 cubic ft. per min., this quantity being circulated by the fans provided on the rotor. A direct-coupled four-pole exciter with interpoles is provided.

The condensing plant is capable of dealing with 88,000 lb. of exhaust steam per hour, and maintaining a vacuum at the turbine exhaust branch of 28 in. (Bar. 30 in.) when supplied with 11,000 gallons of cooling water per minute at a temperature of 80° F. The condenser is of special design, and contains 14,000 sq. ft. of cooling surface. The air pump is of the Mirreles-Leblanc rotary type running at a speed of



2,000 r.p.m., and capable of dealing with 95 lb. of air per hour. The circulating pump is of the centrifugal type, specially designed for high speed, and is capable of dealing with 11,000 gallons of water per minute against a head external to the condenser of 40 ft. The centrifugal water-extracting pump is coupled to the same spindle as the air pump, and is capable of drawing the water of condensation from the condenser and delivering it against a head of 16 ft. above the pump centre. These three pumps are all mounted on one spindle and driven at 2,000 r.p.m. through flexible coupling by a three-stage steam turbine exhausting into the main condenser.

## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

### QUESTION No. 1,422.

Describe a workshop method of testing the permeability of dynamo yokes after machining. The diameter of yoke is about 20 in., and the test is required to show whether the yoke is homogeneous.—S. K.

(Replies must be received not later than first post Monday, Jan. 4th.)

### ANSWERS TO No. 1,420.

What are the modern methods employed to protect consumers on the L.T. sides of transformers from accident due to high voltage?—"UNITE POLE."

The first award (10s.) is given to "J. I. E." for the following reply:—

We will consider first the case of a transformer supplying a low-tension A.C. system. There are three methods of protection which are in general use:—(a) The neutral point earthed either direct or through a resistance; (b) a copper shield between high- and low-tension windings; (c) an electrostatic device connected to the low-tension windings. The first method is perhaps the one most generally in use, and so long as the earth is in good order, affords perfect protection. The transformer, of course, must be star-wound. With this arrangement an earth on one line means a dead short on one phase, and it may be advisable to introduce a resistance between the transformer winding and earth in order to limit the short-circuit current. When dead earthed, the maximum potential above earth will not exceed the low-tension voltage, but with a resistance introduced the maximum potential will be greater, depending on the amount of resistance. The second method consists of a protecting shield placed between the high-tension and low-tension windings, and connected to earth. It has several disadvantages. In order to be a real safeguard the copper must be of appreciable thickness, otherwise a breakdown might burn a hole in the shield and thus allow the high potential direct access to the low-tension windings. Unfortunately, the greater the thickness of the shield, the less satisfactory is the transformer, so far as efficiency, heating, &c., is considered. Also, repairs, if necessary, to the earth shield are somewhat troublesome. For these reasons this method of protection is not so much

used now. The third method embraces the Cardew and similar devices. In one modern make this takes the form of two circular brass plates fixed one above the other, with a gap of about  $\frac{1}{4}$  in. A piece of aluminium foil is fixed by one end to the lower plate, which is connected to earth. The upper plate is connected to the transformer winding. As the plates are at different potentials, the free end of the aluminium foil is attracted to the upper plate, the force of attraction depending on the difference of potential. The distance between the plates can be adjusted so that if the low-tension winding becomes accidentally charged above a certain voltage, say 500, the aluminium foil makes contact between the two plates, thus permitting the excess charge to flow to earth. The whole arrangement is mounted inside the transformer case. Many transformers are now in use with rotary converters supplying D.C. systems, and the protection of such systems may now be considered. The rotary may be arranged to give 3-wire for lighting or 2-wire for traction, or may be arranged to give either as required. In the former case the mid-wire of the system is usually earthed, and in the case of traction the negative is earthed by the rails. When the machine is running, the low-tension windings are metallically connected to the D.C. system through the armature of the rotary converter, so that it will not be possible to get a dangerously high potential on the D.C. side in case of a breakdown in the transformer. However, if the converter is disconnected from the bus-bars, then there is no protection for the set. If the set is used for lighting only, then any of the three methods discussed above could be used, but if the set is to be used for traction, only the second and third methods are available, as earthing the neutral of a transformer with the negative D.C. earthed would cause a short. Where converting sets are concerned, the electrostatic method of protection seems to be most used.

The second award (5s.) is made to "Quis," who writes as follows:—

The standardisation of modern transformer design does not, as a rule, provide for protection against the occurrence of faults between high- and low-tension windings. Instead of embodying a safety device in the construction of the transformer, it is considered sound practice, in view of the improved consistency and reliability of insulating materials, to allow for and depend upon an ample factor of safety in this respect. Taking as an example a transformer intended for operation at 2,000 volts on the high-tension side, the practice of one of the principal British manufacturers is to require that the winding shall stand up against 7,000 volts to frame and between windings, applied for one minute immediately after the transformer has been taken off its heat run. In the event of a customer requiring additional protection, however, two methods are available as an integral part of the transformer and one as an auxiliary to a large installation. Of the former, the first consists in the provision of earth shields between the windings. As the name implies, the shields take the form of sheets of copper foil disposed between the windings and earthed to the frame. In the case of sandwich-wound shell-type transformers—and it is to this type that earth-shields are best adapted—the sheets are rectangular in shape, with rounded corners and a similar hole in the centre. In the case of concentric-wound core-type transformers, the form is that of a concentric cylinder. In both types, of course, it is necessary to slot the shield in such a way as to prevent its constituting a short-circuited winding. The provision of earth-shields does not add considerably to the cost, as the same frame would be used in either case; but a slight sacrifice in efficiency is entailed, owing to the space occupied by the shields and the extra insulation. The second method of protection is by the use of Cardew's earthing device. A flat cylindrical brass box, the top and bottom of which are insulated from each other, contains a leaf of corrugated aluminium foil. The bottom is connected to the frame—and so to earth—and the top to one terminal of the low-tension winding. The electrostatic attraction at the normal voltage is without effect, but should a fault occur between high- and low-tension windings, the aluminium leaf is attracted, earths the high-tension side, and so, as when earth shields are employed, isolates the transformer either by blowing the high-tension fuses or by tripping the circuit-breaker. The device is convenient, in that it can be added at any time and to otherwise standard transformers. But mounted as it is within the transformer tank—though, of course, above the oil level—there is at least the possibility that it will stick, due to the presence of a film of oil, at just the moment when it is called upon to operate. The third method, though not an integral part of the transformer, has much to recommend it; indeed, in the case of heavy

service or extra high-tension transformers, it is the only feasible method. It consists in the suitable application of the Merz-Price protective system. A fault between high- and low-tension windings can be arranged to isolate the particular transformer affected without disturbing those operating in parallel; while incidentally the same apparatus may be caused to isolate the transformer in the event of an earth on one phase or a short between turns.

### CAMP LIGHTING

ONE of the directions in which the war has given special work to the electrical industry is in the lighting of the numerous camps which have been formed for the Regulars and Territorials in various parts of the country. Last Monday, at Gailles, near Glasgow, the light was switched on in two large contiguous camps established for the two battalions of 1,100 men each, which have been raised by the Glasgow Corporation. The camps consist of 80 ordinary huts, 27 huts for officers' quarters, and also guard-rooms, dining-rooms, baths, cooks' houses, regimental institute, and a rifle range for each battalion. There are in all about 1,200 lamps, and the area covered by the camp is about 500 by 250 yards. The order for the lighting of the camps was given only on Nov. 15th, so that the work has been extremely rapid.

Current is taken as a tapping from one of the Glasgow Corporation's 11,000-volt feeders, which passed conveniently about 240 yards away. A 25-kw. transformer converts the current to 240 volts, and the wiring is converted direct on to the three-phase secondary. An underground cable connects the transformer to the first hut, and thence the wiring between the huts is overhead with 200-megohm grade wire-on insulators. It was deemed advisable to use lightly-insulated instead of bare wire to guard against the danger of short-circuits.

### THE ASSOCIATION OF SUPERVISING ELECTRICIANS

THE Proceedings of this Association for next year will commence with the half-yearly meeting and informal discussion on Jan. 19th. The following Papers are also announced:—"Intercommunication Telephones," by H. S. White (Feb. 23rd); "D.C. Motors," by E. F. Butler (March 30th); and "Lightning Conductors," by H. C. Hands (April 27th). The Annual General Meeting is fixed for May 25th.

At the last meeting, on Dec. 15th, a Paper on "Wiring Systems," by Messrs. C. J. Banister and C. R. Bates, was discussed. Some other interesting Papers have been read, and we have received copies of them and reports of the discussions from the Secretary, Mr. C. J. Banister (14 Pulborough Road, Southfields), from whom all information as to the Association can be obtained.

In the first Paper of the Session, on Sept. 29th, Mr. A. H. Dykes reviewed the subject of private generating plants, emphasising the importance of ample battery capacity, and recommending that where the engine-room was far from the house it was better to have the battery at the house rather than at the engine-room. After a few words on the estimation of water power, he compared the different types of engine available, preferring the oil engine to either steam or suction gas plants for intermittent work. Among the simplest were the hot bulb paraffin engine and the "semi-Diesel," but these engines required to be worked on a fairly steady load, and were not well adapted for running on very varying loads.

Another interesting Paper was that by Mr. H. C. E. Jacoby on "Single-Phase Commutator Motors," read on Nov. 10th. In this he described a motor of his own design, known as the "Bandy" motor, in which the speed is automatically controlled by a centrifugal governor, which shifts the brushes, and a handwheel is provided to vary the speed at which this acts. Such a motor is very suitable for lift work. Various other methods of speed variation were referred to and a method of electrical braking was described involving fitting the armature with slip-rings which could be short-circuited when required.

**Metal Filament Lamp Litigation.**—The action by the B.T.H. Co. against Duram, Ltd., for alleged infringement of their metal filament lamp patents, was in the Appeal Court list on Thursday in respect of an appeal by the plaintiffs against an order by Mr. Justice Neville granting "discovery" of their books. There were, however, several other cases in front, and the appeal will go over until next sittings.

### REVIEWS OF BOOKS

**Fuel: Solid, Liquid, and Gaseous.** By J. S. S. Brame. 372 pp. 9 in. by 6 in. 73 figures. (London: Edward Arnold.) 12s. 6d. net; abroad, 13s. 2d.

When it is remembered that in a modern power station of large size the fuel costs are from 50 to 65 per cent. of the total generating costs, the importance of fuel to an electrical engineer cannot well be over-estimated. The volume before us treats of fuel in a clear manner; its fault is that it is somewhat academic manner, and practical questions such as comparative costs and reliability of working do not always receive due consideration.

Solid fuels are dealt with in some 160 pages, and reference is made to all ordinary solid fuels. The storage of coal is shortly treated, and the question of wet or dry storage is considered. It is now the generally-accepted opinion that storage in considerable bulk for long periods can only be done safely under water, whereby all risk of oxidation and spontaneous combustion is avoided. The coking of coal is considered at some length, and a brief reference is made to by-product recovery, but such recovery is being adapted upon a much larger scale than the author indicates.

Oil fuels for firing boilers as apart from internal combustion engines are fully treated, and most of the atomisers on the market are illustrated and described. The author does not make it clear, however, that, for equal evaporation, the cost of oil fuel is double that of coal at current prices. The fascinating problem of surface combustion is shortly given, and there is little doubt that it is destined to play an important part in economic steam production. Already a nett efficiency of 90 per cent. has been obtained. The commercial combination of gas producers, ammonia recovery plant, and surface-combustion boilers offers the possibility of reducing fuel costs by some 25 per cent., without allowing for any possible increase in turbine efficiency due to higher superheat.

It is of interest to note that one Board of Trade unit is equivalent to 3,400 B.Th.U., but yet, with good modern turbine plant and with efficient boilers, it is necessary to expend 30,000 B.Th.U. under the boiler to obtain one unit of electricity, i.e., the efficiency of conversion is only 11½ per cent. The scientific purchase of coal on a heat and ash basis is given in Chapter XIX., and two examples are set out; in view of the importance of such purchase, more modern examples might have been cited and at greater length.

On the whole, the book is well and carefully written, and is one to recommend to engineers interested in steam generation.

**Photo-Electricity.** By A. L. Hughes. 144 pp. 8½ in. by 5½ in. 40 figures. (Cambridge: The University Press.) 6s. net; abroad, 6s. 4d.

In this work are set forth the results of recent research on the effects of light on electrical phenomena, more especially the influence of gases ionised by light upon the discharge of electricity from conductors. The subject is handled very fully, and it will be a great convenience to those interested in this branch of physics, which, besides its theoretical importance, is not without interest in connection with the effect of sunlight on wireless telegraphy, to have the work of many investigators brought together into a connected account.

**India Rubber Laboratory Practice.** By W. A. Caspari. 196 pp. 7½ in. by 5 in. 25 figures. (London: Macmillan & Co., Ltd.) 5s. net; abroad, 5s. 4d.

The perusal of this book by users of electric cables will tend to make them very uneasy. The practices—and factices—used in manufacturing rubber are described; the list of materials, other than rubber, employed in manufacturing vulcanised rubber is appalling, and the methods of detecting too liberal a use of these are sometimes difficult. In his book, which is evidently written as a result of long experience in the testing of rubber, both during and after manufacture, the author deals with the subject with extraordinary frankness. We should welcome a companion volume dealing specifically with india-rubber for electric cables, and telling the buyer of these what are the best general means to employ, other than laborious, difficult, and sometimes inconclusive laboratory tests, to discriminate between good and bad rubber from the point of view of durability and maintenance of its physical properties.

**The Year Book of Wireless Telegraphy and Telephony.** 1914. 744 pp. 8½ in. by 5½ in. 32 figures. (London: Marconi Press Agency, Ltd.) 2s. 6d. net; by post, U.K., 2s. 11d.; abroad, 3s. 6d.

This very comprehensive year book has increased in size considerably since last year's issue. The interesting chronological record with which it opens has been extended in both

directions to include earlier researches and recent developments. The reference sections of the volume dealing with the rules and regulations in force in various countries, and the list of land and ship installations have also been much enlarged, and a very complete list of call signals is given. The series of special articles is also somewhat different from those of last year, and includes:—Waves and Wave Motion, by Prof. J. H. Fleming; the Juncture of the Atmosphere in Transmission, by Dr. J. Erskine Murray; The Measurement of the Strength of Wireless Signals, by Prof. E. W. Marchant; Problems of Wireless Telephony, by C. E. Prince; Wireless Telegraphy in the Merchant Service, by G. E. Turnbull, and other articles on wireless telegraphy in life-saving, meteorology, and time signals, followed by some notes by Dr. Eccles on the work of the British Association Committee. Glossaries of technical

terms and much other useful data complete a valuable volume of reference.

**The Motor Manual.** 266 pp. 7½ in. by 5½ in. About 250 figures. (London: Temple Press, Ltd.). Seventeenth edition. 1s. 6d. net; by post 1s. 9d.

The seventeenth edition of this popular work has been thoroughly revised, and contains a mine of useful, practical, and reliable information to the motor-car user. The ignition section has been brought up to date, particularly as regards modern patterns of magneto, and as befits the advances in the subjects, automatic engine starters and electric lighting are more fully treated than formerly, with the aid of many excellent new illustrations. It is not every work of this kind that is kept as thoroughly abreast of modern practise as this.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Dec. 17th, 1914

A full list of electrical patents published last week appeared in our last issue. The following are abstracts of some of the more important specifications.

**Names in italics indicate communicators of inventions from abroad.**

26,546/13. **Heating Elements.** E. B. COX. The resistance is in the form of a strip wound on, but insulated from, a metal tube, and is enclosed in a watertight space between it and an external sheath, from which it is also insulated. Connection is made by good conducting material wound over the ends of the coil, and terminal wires are brought in through internal tubes sealed so as to be watertight. The outer metallic covering is formed by winding on strip and afterwards making this continuous by electro-deposition or spraying of metal. (Three figures.)

27,480/13. **Wireless Telegraphy.** MARCONI'S WIRELESS TELEGRAPH CO., LTD., and H. J. ROUND. A method of eliminating atmospheres which cannot ordinarily be tuned out by using a receiving circuit slightly out of tune with the signal waves, so that the induced free and forced oscillations are of suitable relative frequency to produce beats. These beats are rectified, and the detecting circuit is tuned to their frequency. (Three figures.)

29,245/13. **Telephony.** S. G. BROWN. A bridge method of connecting telephones with the object of preventing the speaker's voice and other local sounds from being reproduced in his receiver and disturbing him. The receiver is connected across a resistance divided into two parts by a connection to the transmitter, while an artificial line of suitable electrical constants is placed between one end of the resistance and the line in parallel with the transmitter. (One figure.)

3,328/14. **Cable Grip.** ST. HELEN'S CABLE & RUBBER CO., LTD., and J. C. WHITE. A method of taking the stress of the conductors of a flexible cable covered with whipcord or other sheathing. A tapered annular plug is driven in axially under the sheathing, the expanded portion bearing against the cover of the plug or outlet box. (One figure.)

10,868/14. **Condensers.** G. GILES. The electrodes are formed by layers of lead applied in such a way as to combine with the surface of the glass.

17,465/14. **Train Control.** N. W. STORER. A control system for high-tension D.C. railways, in which a storage battery for supplying energy to auxiliary apparatus at certain times is connected in series with the main motors when they are receiving current, the main current being shunted through the auxiliary apparatus when required. (Three figures.)

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.\*

Summaries of some of the more important of these Patents will appear in our next issue.

**Distributing Systems, Cables and Wires, Insulating Materials, &c.:** A. G. BROWN, BOVERI ET CIE [Insulators] 27,734/13; B.T.-H. CO., WHITAKER and WEDMORE [Distribution systems] 29,984/13.

**Dynamos, Motors, and Transformers:** B.T.-H. CO. and WHITAKER [Starting synchronous machines] 4,559/14; GRAEMIGER [Motors and clutches] 8,699/14.

\* It is announced that from Jan. 1st, 1915, the price of printed specifications will be 6d. each, including inland postage, instead of 8d. as at present.

**Electrometallurgy and Electrochemistry:** HÄRDÉN [Furnaces] 570/14.

**Switchgear, Fuses and Fittings:** HOLT and MÖLLER [Circuit breakers] 23,247/13; B.T.-H. CO. (G.E. Co., U.S.A.) 29,662/13; ELLISON and JONES [Switches] 29,822/13; IRRIGAN ELECTRIC CO. (Cutter-Hammer Mnf. Co., U.S.A.) [A.C. control apparatus] 8,957/13.

**Telephony and Telegraphy:** MILLER [Production of oscillations] 20,806/13; MARCONI'S WIRELESS TELEGRAPH CO. and RYAN [Wireless control of valves] 23,340/13; AUTOMATIC TELEPHONE MANUFACTURING CO. and SPERRY [Telephone systems] 25,780/13; FREEMAN [Cable-laying apparatus] 26,447/13; WESTERN ELECTRIC CO. (Woodward for W.E. Co., U.S.A.) [Ring-off relays] 28,159/13; SHEPARD and McKECHNIE [Wireless telegraphy and telephony] 1,169/14.

**Traction:** BETHENOD [Car-lighting dynamos] 27,945/13; WADSWORTH [Combined starters, dynamos and ignition timers] 1,174/14; SOC. D'ELECTRICITÉ MORS [Railway signalling] 2,741/14; B.T.-H. CO. (G.E. Co., U.S.A.) [Car-lighting system] 5,019/14; BARDSLEY [Tramcar brakes] 5,377/14; BROOKS and HOLT [Car lighting] 8,855/14; MULLANEY [Traversers] 10,619/14.

**Miscellaneous:** PULLIN [Electromedical apparatus] 26,273/13; BARR, STROUD and FRENCH [Transmission of observations] 28,125/13; ROSS and SCHOFIELD [Electrostatic apparatus] 1,757/14; GEUGENBACH [Ironclad electromagnets] 11,492/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Switchgear:** GEH. JAEGER [Tumbler switches] 29,341/13; SIEMENS SCHUCKERTWERKE GES. [Switches] 18,502/14.

**Traction:** SOC. DES ÉTABLISSEMENTS L. BLERIOT [Car lighting] 23,075/14.

### Opposition to Grant of Patents

22,331/13. **Lamp Filaments.** C. O. BASTIAN. Opposition has been entered to a grant on this specification, which describes helically-wound drawn wire filaments in which the wire is provided with a coating during preparation to keep the convolutions apart. This coating is removed after mounting the filament.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

25,774/00. **Number Sign.** W. JOHNSON and J. MAKIN. Electric signs in which changing numbers, such as are required in programme indicators, are formed by lighting combinations out of a group of lamps by means of a drum-type controller.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Arc Lamps:** F. J. GREEN [Clutch arc lamp] 19,110/02; C. O. BASTIAN [Mercury vapour lamps] 18,624/03.

**Dynamos, Motors, and Transformers:** F. PICHLER [Air-cooling vanes for transformers] 17,664/01; A.E.G. (Berlin) [Cooling of generators] 19,259/06; B.T.-H. CO. (G.E. Co., U.S.A.) [Transformer cores] 19,548/06.

**Electrochemistry and Electrometallurgy:** H. SCHMIDT [Electrolysis] 18,480/07.

**Switchgear, Fuses, and Fittings:** M. B. FIELD and FERRANTI, LTD. [Solenoid-operated oil switches] 17,699A/05; A. WHITE [Switches] 19,708/07.

**Telephony and Telegraphy:** P. M. JUSTICE (Millet Signal Co., U.S.A.) [Microphone for detecting vibrations] 19,911/09.

**Traction:** SIEMENS & HALSKE A.G. (Berlin) [Working of signals and points] 10,778/06 and 16,164/08.

**Miscellaneous:** W. J. POOLE [Magnetic clutches] 19,738/07.

### TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

At the Royal Society, on Dec. 3rd, Mr. de Lange described a "thermophone," which he had devised in conjunction with Mr. Otto Fischer. In the original Preece platinum wire instrument dating back to 1880 the wire was connected to a membrane. Seven years ago Gwodz (in some experiments made near the now famous town of Lodz) made a thermo-telephone without a membrane or electromagnet by placing a Wollaston wire in an insulating medium and treating the wire with acid, but the volume of sound obtained was small. About the same time Prof. Abraham, of Paris, used a thin, straight platinum wire between electrodes. Mr. de Lange fixes a platinum wire of a diameter of from 2 to 12 microns in a Gothic curve, and claims to have made a thermophone of "practical, everyday use," because the silver of the Wollaston wire is eliminated, and the whole Wollaston wire is suspended in the acid in such a way that such part of the wire can be set free as is considered desirable. It is necessary to enclose the instrument under a thin metal cover with one or more small openings, and surrounded with some cooling substance. The cover acts as a resonator. The sound is conducted through a small rubber tube.

At a meeting of the Wireless Society of London, at the Institution of Electrical Engineers last Friday, Prof. G. W. O. Howe delivered a lecture on "High Frequency Resistance of Wires and Coils." He dealt with the subject from the point of view of applying the so-called telephone transmission formulæ. He showed mathematically how it was possible to calculate the current density in a flat conductor for very high frequency at any point and at any depth in terms of the current density on the surface, whilst the method could also be applied to calculating the resistance of the earth to wireless waves sent out from an antenna. With a round conductor the formulæ were equally applicable so long as the penetration was not very deep. In other words, the formulæ applied if the penetration did not exceed one-third of the radius of the wire. He has found this method gave the same results within a very small error as are obtained by means of Lord Kelvin's formula. It could also be applied to steel rails used on single-phase railways as the return. Permeability came in, which was rather uncertain; it depended upon the magnetisation and differed from point to point, but with a frequency of 50 cycles, a specific resistance of the steel of 20 microhms, and a permeability of 1,000, the penetration into the rail was of the order of 1 to 1½ mm. With a frequency of 25 the penetration was nearly 2 mm. With round wires and low frequency, the telephone transmission formulæ was not applicable. This problem, he said, had claimed the attention of leading mathematicians for the last few years, viz., the resistance to alternating current of a coil or round wire, and the results had been very divergent and unsatisfactory. None of the results could be relied upon, and there was room for much experimental research work. Capacity currents came in and made it very difficult to measure the resistance with very great accuracy. Mr. W. Duddell, F.R.S., in the brief discussion which followed, said he believed the character of the insulation was largely responsible for the varying results obtained upon the resistance to alternating current of a coil or round wire.

The use of high-speed printing telegraph apparatus is now used to a considerable extent in daily newspaper offices, and it is satisfactory to learn from a brochure that we have received from Creed, Bille & Co., Ltd. (Felsdon Road, Croydon) that it is a British system which has solved the difficulties formerly encountered. A German system was at one time experimented with by the Post Office, but was afterwards withdrawn, and the Creed system, in addition to its newspaper work mentioned above, has been working uninterruptedly on the Edinburgh-London circuit for six years, and during the past few months it has been installed at Glasgow, Manchester, Liverpool, Birmingham, Grimsby, and elsewhere with highly satisfactory results. A "Kleinschmidt" perforator with a typewriter keyboard is used. The strip from this is passed through the transmitter, and the receiver automatically punches a similar strip either by the "Creed" electro-pneumatic receiving perforator or the "Bille" electric motor-driven apparatus. This second strip is passed through the Creed printer, which delivers the message in printer characters on a paper tape. Another instrument of the series is the Creed telegraph translator, which produces from a Creed strip another strip perforated with signals as used for automatic transmission on cable circuits.

### ELECTRIC TRACTION NOTES

The L.C.C. engineers at Greenwich were extremely prompt in their work in reinstating the supply after the accident described in our last issue. Work was taken in hand as soon as the plant was cool enough to handle, and one generator set was connected up and running within twelve hours. The remainder were replaced at the rate of one a day, and all were at work within a week of the shut down with permanent cable connections, and the two reciprocating sets (of which a few stator coils had been burnt out owing to the absence of protective reactances) were also fully repaired by that time. While these repairs were proceeding, a restricted car service was run through supply obtained from the London Electric Supply Corporation, the London United Tramways Co., the Leyton Urban District Council, and the West Ham Borough Council. A special cable was connected from the St. Pancras station to a local L.C.C. sub-station, and supply was given in this way on the Sunday following the accident. At the meeting of the Council on Tuesday, Sir John Benn moved that a Special Committee of seven be appointed to inquire into the circumstances of the breakdown, and as to what should be done in future. He alleged that it was due to the refusal of the Council to adopt the suggestion of the Progressives to build a second power house as a standby. Mr. G. Hume, Chairman of the Highways Committee, said the matter was being made a party question, and he would not agree to a Committee to inquire into the whole tramway policy of the Council. The resolution was defeated by 42 votes to 32.

There is a prospect of the Brighton and Hove Corporations discussing the relative merits of the under- and over-running trolley omnibus systems in order to avert arbitration as to the system to be adopted on the through routes.

The subject of audible and other cab signalling on railways was discussed at a meeting of the Institution of Mechanical Engineers last Friday. The general principles were dealt with in a Paper by Mr. W. C. Ackfield (Midland Railway), who thought it unlikely that a purely mechanical system could be designed suitable for general railway service, but looked forward to a successful electrical or electro-mechanical system. Mr. V. L. Raven described his system, which has been in use on certain sections of the North Eastern Railway for over two years, and is fitted to 36 locomotives. This is a purely electrical system, and in its essentials was described in a Paper before the Institution of Electrical Engineers a few years ago (see *ELECTRICAL ENGINEERING*, Vol. II., page 935, Dec. 12th, 1907). A further Paper by Mr. W. A. Stanier described the combined audible train control and audible signal systems in use on the Great Western Railway (see *ELECTRICAL ENGINEERING*, Vol. I., pages 341, March 7th, 1907). The last Paper, by Mr. W. Willox, described the all-electric train stop used on the electrically-worked section of the Metropolitan Railway.

The electrical working of the 113 miles of the Chicago, Milwaukee & St. Paul Railway, for which the contract has just been placed, presents several points of interest. According to the *Electric Railway Journal*, overhead conductors are to be used with a contact line pressure of 3,000 volts D.C. with flexible catenary construction and pantograph collectors. Power will be supplied to the four sub-stations (which will be equipped with synchronous motor-generators) at 110,000 volts three-phase 60 cycles from water-power stations of the Montana Power Co. Very large and powerful locomotives will be used, constructed in two permanently-coupled units, each having eight driving wheels and a four-wheeled bogie at the end. The driving axles are arranged in pairs upon a series of four articulated trucks, two under the main frame of each unit. Each driving axle is twin-gear to a 375-h.p. (continuous-rating) motor, and the motors are permanently connected in pairs in series. The whole vehicle weighs 260 tons, of which 200 tons is available for adhesion, and the starting draw bar pull will be 80,000 lb. The passenger locomotives will haul an 800-ton train at 60 m.p.h. on the level, and the goods locomotives will haul a 2,500 train up a 1 per cent. gradient at 16 m.p.h. The control provides for regenerative braking. The plant and locomotives are being supplied by the General Electric Co. of America.

**Crystal Palace School of Practical Engineering.**—The 126th award of certificates and the usual inspection of the school took place last Thursday. Sir Francis Fox was in the chair, and Sir David Burnett and other trustees were present.



## "ELECTRICAL ENGINEERING" TRADE SECTION

### CATALOGUES, PAMPHLETS, &c., RECEIVED

**METAL FILAMENT LAMPS.**—A leaflet from L. Andrew & Co. (2 Whitworth Street West, Deansgate, Manchester) gives prices of "Wrendal" British-made metal filament lamps.

**CHRISTMAS PRESENTS.**—A list from the Edison & Swan United Electric Light Co., Ltd. (Ponders' End, Middlesex, and 123-125 Queen Victoria Street, E.C.) collects together a number of their manufactures of an electrical nature suitable for Christmas presents, such as radiators, table lamps, vacuum cleaners, electric kettles, hot plates, irons, etc.

**SWITCHES AND FUSES.**—A collection of new leaflets from Ferranti, Ltd. (Central House, Kingsway, W.C.), deal with knife switches, isolating switches, ironclad switches and fuses, combined interlocked ironclad switch and fuse panels, low-tension and high-tension switchboard type tubular fuses of several types, including fuses for potential transformers and liquid resistance protectors for electrostatic instruments.

**RADIATORS.**—A new type of electric fire with a glowing coiled wire heating element arranged zig-zag between porcelain bars is also described in leaflets from Ferranti, Ltd. These are made up to 3 kw.

**POCKET WAR MAPS.**—Drake & Gorham, Ltd. (66 Victoria Street, Westminster), have brought out a very convenient little booklet containing miniature coloured maps of the war districts of France, Russia, Austria, and Serbia, and at the same time calling attention to some of their many electrical specialties.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**RADIATORS.**—An attractive form of 600-watt glowing coil radiator with reflector is illustrated on a postcard from Haylock & Haslett (63 Queen Victoria Street, E.C.).

**ELECTRICAL SUPPLIES.**—Leaflets from Krupka & Jacoby, Ltd. (39 Victoria Street, S.W.), deal with radiators and accessories of British manufacture and cables of Dutch manufacture.

**INTERCOMMUNICATION TELEPHONES.**—An interesting booklet, entitled "Time is Money," from the Western Electric Co. (North Woolwich), sets forth the advantages of the use of intercommunication telephones in large business houses.

**CABLES AND WIRES.**—A new list of "Silvertown" gutta-percha, indiarubber, silk, and cotton covered wires, jointing tools and materials, has been issued by the India Rubber, Gutta Percha and Telegraph Works Co., Ltd. (100-106 Cannon Street, E.C.).

**VACUUM CLEANERS.**—The Electric Suction Cleaner Co. (151 Queen Victoria Street, E.C.) have issued an attractive booklet with coloured illustration setting forth the many good points of their "Frant Premier" electric vacuum cleaner, which is of the self-contained type, with high-speed motor and fan built into the body of the machine, and a revolving brush within the nozzle.

### CALENDARS, &c.

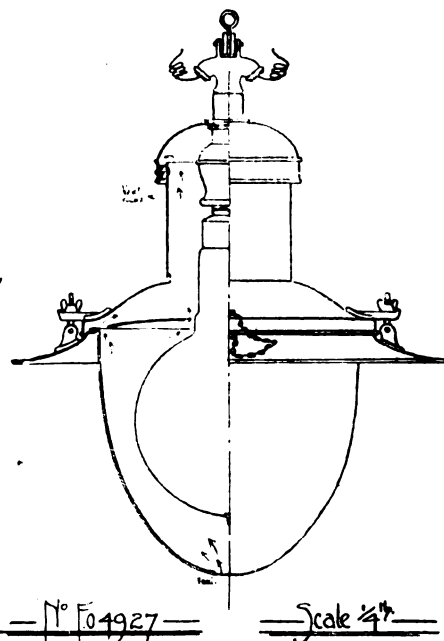
The wall calendar of the United States Metallic Packing Co., Ltd. (Soho Works, Bradford, Yorks), is always an artistic production, and this season bears an embossed representation of a piece of statuary by Lanson named "L'Age de Fer."

A distinctly novel note is struck by the decoration of the daily tear-off calendar which we have received from Pirelli, Ltd. (144 Queen Victoria Street, E.C.). A quasi-Japanese scene thereon embraces a bridge made from a gigantic Pirelli tyre.

**Australia's Trade with Germany.**—The Commonwealth of Australia has issued a pamphlet on this subject giving various particulars regarding trade formerly carried on between Australia and Germany which should now be available for Britain. Tables are given of the exports from Australia to Germany during recent years, and of the imports from Germany, from which it appears that in 1913 £58,888 of electrical machinery, £76,133 of "electrical and gas appliances," £7,244 of telephones, £16,684 of "electrical materials," £16,684 of arc lamp carbons, and £56,450 of cable and covered wire were imported. An extensive list of Australian export firms is also given.

### BRITISH MADE WEATHER PROOF LANTERNS

**F**ITTINGS manufacturers in this country are, to a large extent, recovering from the inconvenience caused by the stoppage of supplies of vitreous enamelled material, a large percentage of which was formerly obtained from Continental sources, as English manufacturers found it difficult to produce vitreous enamelled articles, such as outside lanterns, at prices which would compare with those of their foreign competitors. Various methods have been adopted to combat this temporary dislocation of trade, and in many cases zinc or polished copper is being introduced in the place of



ENAMELLED IRON LANTERN FOR HALF-WATT LAMPS.

enamelled iron. Messrs. Siemens Bros. Dynamo Works, Ltd. (Tyssen Street, Dalston), send us some particulars of copper and zinc lanterns which can be supplied from stock. They are also in a position to supply an entirely British-made lantern for half-watt lamps in vitreous enamelled iron. The design of this lantern embodies many of the advantages claimed for the Continental type, and the cost is about the same. We give a section of the lantern above, showing the principal features of its construction.

### NEW HOLOPHANE GLASSWARE

**I**N these days of restricted street lighting it is more than ever necessary that those lamps which are utilised should give the greatest radius of illumination it is possible to

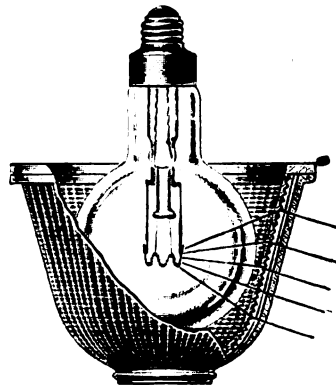


FIG. 1.—NEW HOLOPHANE GLOBE FOR OUTSIDE LIGHTING.

obtain, but with a subdued effect, avoiding all glare. Too many of the existing street lamps throw an intense light

over a small area immediately adjacent to them, whilst large spaces are left without any illumination.

In a pamphlet just issued, Holophane, Ltd., describe a new type of their well-known prismatic glassware which has been specially designed to carry out the requirements of a correctly installed street-lighting system. Hitherto mechanical difficulties have prevented the construction of a unit which, whilst embodying all the advantages of Holophane prismatic glassware, yet at the same time is smooth both on the outside and inside, so that undue accumulations of dust cannot collect, and also is easy to clean. These difficulties have now



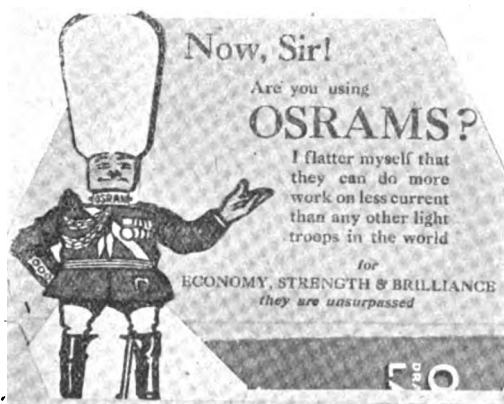
FIG. 2.—LANTERN COMPLETE WITH NEW HOLOPHANE GLOBE.

been overcome by the new Holophane "Refractor" globe, which consists of two pieces of glass provided with horizontal and vertical prisms respectively, one piece being placed inside the other.

By the use of this globe the maximum light is sent out at an angle of  $15^\circ$  below the horizontal, and the intrinsic brilliancy of the filament is reduced whilst the absorption is practically negligible. The lamp is well protected from the weather, but the enclosing glass allows for ventilation, and is not a collector of dirt, and the cost of maintenance is small. A remarkably good distribution of light is obtained.

### "GENERAL ELECTRIC"

A VERY effective piece of Osram lamp advertising is to be found in the surprise envelope now being circulated by the General Electric Co., Ltd. On the flap of the envelope being opened the figure of the "General" springs into view



pointing to a few well-chosen words dealing with the merits of Osram lamps. The figure was designed by John Hassall. An inverted Osram lamp forms his headgear, head, and collar. As an epaulette he wears a tumbler switch, while he is also

decorated with the insignia of the Order of the "Magnet." The trembling-bell medals presumably symbolise his enemies' fear. The only mechanism consists of a piece of elastic band. In the envelope is a neat coloured folder, bearing a view of the Osram Lamp Works, Hammersmith, London, where 1,500 highly-skilled British workpeople are constantly employed, and giving prices of Osram lamps. The Company will be pleased to supply electrical contractors and dealers with these attractive envelopes, complete with name and address over-printed on the folder.

### AN ARC LAMP CARRIER

WE illustrate here a new pattern of "lyre" fitting for arc lamps, provided with lowering gear to enable the lamp to be trimmed from the ground, which has just been brought out by the London Electric Firm (George Street, Croydon). The entire absence of projections will be noticed, and also the unobtrusiveness of the contact-suspension gear.



No external winches or ropes are employed, and the gear further embodies a one-part device which performs a three-part function, viz., a contact-maker, a weight-reliever, and a lock for the canting inner harp, all performed simultaneously by one operation, thereby also ensuring safety, as the lamp cannot be lit until the weight is relieved from the rope and the harp is locked.

**Diesel Engine Users' Association.**—At the annual general meeting of this Association, at the Institution of Electrical Engineers, Mr. J. E. Edgcome was re-elected as President for the ensuing year. Messrs. F. H. Francis and Napier Prentice were elected as members of the Committee in place of the two retiring members. Mr. W. E. Brandreth was re-elected as Honorary Secretary, and as at the present time he is engaged on military duties, Mr. Percy Still was requested to act as Honorary Secretary during Mr. Brandreth's absence. Particulars were given in connection with a recent breakdown of a Diesel engine at Oxford, and an interesting discussion ensued. The subject is to be brought up again for the further consideration of the Association. It was announced that the general question of Diesel Engine Insurance against breakdown would be brought forward for discussion at the next meeting, which is to be held on Friday, January 15th, 1915. We are asked to state that any request for information concerning the Association and applications for membership should be addressed to the Acting Hon. Secretary, Mr. Percy Still, at 19 Cadogan Gardens, London, S.W.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

### Generating Stations, Sub-Stations, Mains, &c.

**Australia.**—The Sydney Corporation require transformer testing apparatus. Further particulars at 73 Basinghall Street, E.C., and tenders by March 15th, 1915.

**Belfast.**—The modified scheme of extensions ordered by the Corporation is estimated to cost £28,000.

**Birkenhead.**—Twelve months' supply of motors and motor-starters from  $\frac{1}{4}$  to 15 h.p. Borough Electrical Engineer. January 12th.

**Bolton.**—The Engineer is to report upon additional engine and boiler plant and switchgear required for the Back-o'-th'-Bank power station.

**Hong Kong.**—Two 1,500-kw. turbo-alternators with condensing plant and switchboards, E.H.T. cable, sub-station switchboards and transformers. Consulting Engineers, Messrs. Preece, Cardew & Snell, 8 Queen Anne's Gate, S.W. January 15th.

**Huddersfield.**—An expenditure of £20,000 upon plant extensions is to be incurred.

**London: Bethnal Green.**—The Finance Committee of the L.C.C. recommends the borrowing of £22,450 in connection with the supply in bulk to be taken. The amount includes:—Mains, £14,536; sub-station plant, £4,269; services, £500; meters, £300. We refer to the question of periods in "Local Notes."

**Hampstead.**—The Finance Committee of the L.C.C. recommends sanction to a loan of £17,300 for electrical extensions, which includes £6,317 for mains, £8,583 for sub-station plant, and £1,928 for services.

**Stoke-on-Trent.**—Application is to be made for an additional loan of £12,230 for electrical extensions.

**Wolverhampton.**—Mains extensions for public lighting are contemplated at an estimated cost of £1,170.

### Wiring

**Belfast.**—Electric lighting of workhouse, Lisburn Road.

**Shrewsbury.**—Electric lighting at Belle Vue House, Trinity Street. Clerk to Guardians, St. John's Hill.

**Tunstall.**—Electric lighting of Bradwell Joint Hospital. Architects, A. R. Wood & Son, Tunstall.

### Miscellaneous

**Leeds.**—A 60-ton overhead electric travelling crane, and coal and ash conveying plant, is required for the Electricity Department. Manager. January 22nd.

**London: L.C.C.**—An expenditure of £12,725 is recommended upon cables, sub-station equipment, and cars for the reconstruction of the Burdett Road to Grove Road (Bow) tramways.—A motor is required in connection with the testing of electricity meters.

## TENDERS RECEIVED AND ACCEPTED AND ORDERS PLACED

**L.C.C.**—The following tenders have been received for high- and low-tension switchgear for tramway sub-stations:—Johnson & Phillips, £1,177 19s.; Spagnoletti, £1,240 7s.; Ferguson, Pailin & Co., 1,275; Switchgear & Cowans, £1,275 3s.; Westinghouse Co., £1,324 17s. The tender of Ferguson, Pailin & Co. is recommended for acceptance. This tender is the only one which does not conform to the model conditions of contract of the Institution of Electrical Engineers. The Highways Committee reports that it has been in communication with the B.E.A.M.A. for some time as to certain conditions of contract put forward by that Association,

and states that before such conditions can be accepted several substantial alterations in the Council's Standing Orders will have to be made, and, quite apart from the consideration of the principle involved, the procedure to effect these alterations will occupy considerable time.

The Edison & Swan United Electric Light Co. has received a twelve months' contract for the supply of Royal Ediswan lamps to the Cunard Steamship Co.

United Water Softeners, Ltd., have received, among recent contracts, orders from the Admiralty, Vickers, Ltd., Armstrong, Whitworth Co., Brunner, Mond & Co., Daily Chronicle Paper Mills, Erith Oil Works. Since the outbreak of war the firm has entered into contracts for erecting over 100 installations for dealing with several millions of gallons of water daily.

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. George Smith & Son, of 5 Philpot Lane, E.C., inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £61 to £61 10s. (last week, £61 10s. to £62).

**Christmas Holidays.**—The ordinary business of the British Thomson-Houston Co., Ltd. (Mazda House, 77 Upper Thames Street, E.C.), will be suspended on Friday and Saturday, January 1st and 2nd, on account of the annual stocktaking. The trade counter only will remain open to deal with urgent inquiries and orders.

## LOCAL NOTES

**London: Bethnal Green: Loan Periods.**—The bulk supply to be taken from the Stepney Borough Council referred to in our "Tenders Invited" column provides for current being supplied at a pressure of 6,000 volts through duplicate cables to two sub-stations, one in the western part of the borough and one in the eastern. In connection with the loan now proposed, the Finance Committee of the L.C.C. draws attention to the suggestion of the Council that a period of forty years should be allowed for the repayment of the loan for mains and twenty-five years for sub-stations with all the plant, but points out that until the general system of trunk mains to be laid throughout London has been settled, any departure from the period of twenty-five years for mains at present allowed should not be made. A period of only fifteen years is recommended for sub-station plant, and thirty years for the buildings.

**Hampstead: Preferential Charging.**—The Council has decided to contribute £10 towards the fund which is being formed by the I.M.E.A. for fighting the Ilford case, and has also authorised the Engineer and Manager to give evidence if desired.

**The L.C.C. Power Scheme.**—The Council supports a number of other borough councils in regretting that the L.C.C. has not yet seen its way to withdraw its electric supply Bill for next session.

**St. Pancras: Loan Periods.**—In our issue for Oct. 8th, p. 537, we referred to a proposal by the London County Council that the St. Pancras Council should agree to reduce the outstanding periods of the 42 years' loans on their machinery and plant, and that the Council was unable to see its way to agree to the suggestion. Since then a meeting has been held of representatives of the Finance Committee of the Council and the Loans and Estimates Sub-Committee of the L.C.C., with the result that it is now believed to be very unlikely that the matter will be further pressed by the County Council.

**Portsmouth: Death from Electric Shock.**—One of the electrical engineers at the Corporation's electric power station, Mr. F. W. Hepworth, was found in the station last week dead from electric shock. Subsequent examination showed that the deceased must have caught hold of a bare flexible lead for a rectifier apparently under the impression that the main switch was off. He had received a shock of 3,000 volts.



# ELECTRICAL ENGINEERING

With which is Incorporated  
**THE ELECTRICAL ENGINEER**  
(Established 1884)

No. 418 [VOL. X., No. 52]  
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THURSDAY, DECEMBER 31, 1914.

[PRICE ONE PENNY.  
*Registered as a Newspaper.*

## ELECTRICAL ENGINEERING.

The Engineering Journal of the Electrical Industry

PUBLISHED EVERY THURSDAY. Price 1d.

### SUBSCRIPTION RATES.

United Kingdom. 6s. 6d. per Annum.

Canada. 8s. 8d. per Annum.

Other Colonies and Abroad. 13s. per Annum.

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All letters to be addressed to "Electrical Engineering," at the EDITORIAL AND PUBLISHING OFFICES: 203-206, TEMPLE CHAMBERS, LONDON, E.C.

Telegrams: "Cireling, Fleet, London."

Telephone No.: 5509 Holborn

Cheques to be made payable to THE KILOWATT PUBLISHING CO., LTD., and to be crossed LONDON COUNTY AND WESTMINSTER BANK (Temple Bar Branch).

## SUMMARY

14,000 of the Berlin A.E.G. Co.'s employees, including two hundred officers, left to serve in the German forces. Up to the beginning of December 157 had been reported killed (p. 655).

We give details of the two Bills which deal with the supply of electricity in London. One is by the L.C.C. and the other by a combination of ten of the existing London electric supply companies. Both Bills deal with an area larger than that of the County of London, but the area proposed by the L.C.C. is by far the larger (p. 656).

THE new standardisation rules of the American Institute of Electrical Engineers contains a system of rating of electrical machinery based on maximum temperature, and not temperature rise above that of the atmosphere (p. 657).

A PAPER by Mr. F. Broadbent read before the Association of Engineers-in-Charge deals with the applications of electricity in the printing trade (p. 657).

A NUMBER of books on various branches of electrical engineering are reviewed on pp. 658 and 659.

A PAPER by Mr. J. F. Crowley read recently in Halifax reviews the conditions and advantages of electric driving in the woollen trade (p. 659).

A WAY of distinguishing between live and dead cables in a trench is described in our Questions and Answers columns (p. 660).

AN interesting Paper by Mr. H. Scholey, read at the Sales Managers' Association this month, dealt with the position of the electrical industry (p. 660).

WE publish some official statistics with regard to the wireless stations of the world (p. 661).

AMONG the subjects of specifications published at the Patent Office last Thursday are field telephone cable-laying reels, wireless telegraphy, feeder protection, and the starting of rotary converters. A patent for an electrostatic ore separator expires this week after a full life of fourteen years (p. 661).

WE describe an interesting system of electric heating with automatic temperature control and an electric water-heating system employed at the tramway offices in Glasgow (p. 662).

OTHER articles in our Trade Section deal with an instrument for measuring vibration, a shade suitable for reduced street lighting, the coupling-up of ironclad switches on the unit system, and the life of half-watt lamps. Some particulars are also given of German electrical trade with Russia (pp. 662 and 663).

A DIESEL engine set is required at Llandudno; three-phase induction motors at Shanghai; cables at Cleethorpes; and extensions are contemplated at Salford (£22,910), and Stockport (£17,000) (p. 665).

SOME figures are given of the increase in the demand upon the Manchester electricity undertaking since the war.—The discussion as to the management of the Belfast Electricity Department, which has arisen over a very small point, still continues.—A very completely-equipped electrical showroom has been opened at Burton-on-Trent (p. 666).

MAINLY owing to the war, the Silvertown Co. shows a loss of nearly £19,000 for the year to September 22nd (p. 666).

**The A.E.G. and the War.**—It appears from reports of the general meeting of the Allgemeine Elektrizitäts Gesellschaft that 14,000 of the company's employees were mobilised for the war, including 200 officers. Up to the beginning of December 157 had been killed. The company has contributed 500,000 marks per month in allowances to relatives of those at the Front and wounded. In addition to this there have been payments from the retiring pension and other charitable funds maintained by the company. The whole of the 89 employees of enemy nationality have left the firm's service. The total turnover for the business year 1913-14 was 453 million marks against 441 million for the previous year, which, however, included 95 million relating to trade with enemy countries. The latter figure for the year under review cannot be estimated, as accounts from the foreign branches have not come in owing to the war. The total hours of labour worked during the first four months of the year under review exceeded the figure for the corresponding months of the previous year in the proportion of 3 to 2.

**BINDING "ELECTRICAL ENGINEERING."**—Vol. X. of "Electrical Engineering" (Jan.—Dec. 1914) closes with our issue of to-day, Dec. 31st. Readers can have their volumes bound by their own bookbinder; or, they may send their numbers to THE KILOWATT PUBLISHING CO., LTD., Temple Chambers, London, E.C., carriage paid (with the reader's name and address), and a remittance of 4s. 6d. under separate cover. The volumes will then be bound and returned carriage paid to any address in the United Kingdom, or carriage forward to the Colonies or abroad. Binding Cases (including index, but not including binding) 2s. each, or post free 2s. 4d. (Abroad 2s. 6d.) Index alone, 1d. (Post free 2d.).



## THE FUTURE OF LONDON'S ELECTRICITY SUPPLY

WE have now had an opportunity of perusing the two Bills which are being promoted in the next session of Parliament to deal with the problem of the future of electricity supply in London. The most important, of course, is that deposited by the London County Council, the main features of which have already been indicated in our columns.

The Bill seeks to set up an Electricity Authority for London consisting of 27 members apportioned as set out in our issue of Dec. 17th, p. 639, and to transfer to this Authority all the powers of purchase at present possessed by the L.C.C. over the London companies' undertakings, and to give power to purchase local authority undertakings by agreement. In addition, the Authority will be endowed with the usual powers of an electric supply undertaking. The area of supply consists of the County of London, the County of Middlesex, portions of the Counties of Essex (including West Ham and East Ham), Hertford, Kent (including Gravesend, Beckenham, and Dartford), and Surrey (including Acton, Kingston-on-Thames, Wimbledon, Barnes, and Richmond).

Under the Bill the Electricity Authority is authorised to supply (a) authorised undertakers; (b) railways, tramways, canals, navigations, docks or waterworks; (c) to any person for any purpose within any portion of the area where there is not at present an authorised distributor, or where at the date of the passing of the Act a supply is not being given; (d) to any person within the area for any purpose with the consent of an authorised distributor. The authority will not be allowed to supply for lighting purposes except in bulk to authorised distributors, and also to the extent of 20 per cent. of any supply given for power purposes. Authorised undertakers will be required to enter into an agreement for seven years, and the maximum price which can be charged for supply under heading (b) is £3 10s. per kw. of maximum demand per annum, plus 0.25d. per unit. No maximum price for supplying authorised distributors in bulk is included in the Bill, but the authority must submit to the Board of Trade within a period of five years from the date of the transfer of any existing undertaking scale of maximum charges for each area so taken over.

Land is scheduled at Barking and Erith for generating stations.

Under Clause 65 of the Bill power is taken to transfer to an "Operating Company" the powers taken by the authority for giving supply and erecting generating stations. This transfer is to be for a period not exceeding 50 years, at the expiry of which the Electricity Authority resumes possession of the undertaking on repayment of the capital expenditure, less the amount paid to sinking or redemption funds. The Authority, which takes powers under another section of the Bill to spend up to £10,000,000 upon capital account, is authorised to advance money to the Operating Company for the purpose of taking over any undertaking, and also to the extent of two-thirds of any expenditure involved for other purposes. The power of the Authority to supply electricity, however, is to cease within five years of the passing of the Act unless an arrangement is made with an Operating Company during this period. In that event, the Electricity Authority would nevertheless be incorporated with the view of introducing uniformity into the supply of electricity in the area covered by the Bill.

Clause 77 of the Bill provides that where any authorised undertaker within the area of supply wishes to extend existing generating stations or erect new ones it must obtain the consent of the Electricity Authority, which consent is not to be unreasonably withheld. Again, any local authority applying for an electricity loan must give notice to the Electricity Authority, and no transfer of an existing undertaking can take place without the approval of the Authority. The Electricity Authority may also apply to the Board of Trade for a revision of the prices charged by any particular authorised undertaker.

Part VII. of the Bill authorises the establishment of the Technical Committee, the members of which are to be appointed by the Electricity Authority, who is to fix the remuneration to be paid.

The Electricity Authority takes full wiring, hiring, and fitting powers, as are at present possessed by all the London Borough Councils.

The second Bill relates principally to an amalgamation of most of the existing London supply companies, and an extension of their powers and areas.

It proposes to incorporate the London Electric Supply Co., with a capital of £6,000,000, of which £2,000,000 is to be 6 per cent. preference shares, to deal with the London electric supply problem on similar lines to those proposed in the L.C.C. Bill, but in a very much smaller area. This area consists of the County of London, the districts comprised in the Metropolitan Electric Supply Company's bulk supply area in Middlesex, a few districts in the rural district of Croydon (but not

including Croydon itself), Romford and Tilbury in Essex, and Penge in Kent. The first directors of the proposed company are: W. F. Fladgate, H. R. Beeton, E. Ironside Bax, W. R. Davies, Colonel R. E. Crompton, R. Stewart Bain, W. H. Cripps, A. E. Franklin, Walter Leaf, and J. Browne-Martin.

It is proposed that the new company shall compulsorily acquire the Charing Cross, Brompton and Kensington, Central Electric, Chelsea, Kensington and Knightsbridge, London Electric, Metropolitan, Notting Hill, St. James' and Pall Mall, and the Westminster companies. The names of the directors given above make it clear that all these companies are joint promoters of the Bill. The London companies not included are the City of London, County of London, South London and South Metropolitan Cos., and who may be expected to oppose the Bill, as their areas are attacked. No definite provision is made as to local authority undertakings, but these may be transferred by agreement.

The main object of the Bill is stated to be to unify the conditions of supply in the area scheduled, to give a supply in bulk to authorised distributors and to railways, tramways, canals, docks, or waterworks upon agreed terms. Agreements for seven years will be required.

In order to bring about the consolidation and uniformity of supply, the company must within three years of the passing of the Act submit to the Board of Trade a scheme for dealing with the whole area, having regard to the existing plant installed in any undertakings transferred or acquired by agreement. The Board of Trade is to inquire into any proposal of an authorised distributor to extend existing plant, and may refuse such extension if it considers that supply in bulk from the new company is a more economical proposition.

The company is entitled, after setting aside a 4 per cent. sinking fund on a 50 years' basis, to pay an 8 per cent. dividend upon the ordinary shares, and to pay any excess into a fund, which, when it exceeds an amount equal to 4 per cent. upon the ordinary shares, is to be used as to three-fourths in giving consumers a rebate on the amount paid by them for the preceding year, the remaining one-fourth being distributable among the ordinary shareholders.

The undertaking of the company is to be transferred to the London County Council or any other authority constituted for the purpose at the end of 50 years on payment of the nominal value of the capital unredeemed, and the payment by such an authority of all the liabilities on capital account.

The above is the third Bill referred to in our issue of Nov. 26th, and is evidently mainly based on the assumption that the L.C.C. scheme will be dropped or thrown out. A clause, however, provides for the contingency of the L.C.C. scheme being passed, and enables the Company to act as the "Operating Company" referred to in the L.C.C. Bill. The second Bill mentioned by us on Nov. 26th, which was for the sole purpose of giving these powers, has been dropped.

**Magnetic Tests of Iron with Alternating Currents.**—In a Paper read before the Scottish Local Section of the Institution of Electrical Engineers recently, Mr. J. S. Nicholson dealt with the difficulty that is experienced when testing iron stampings at high flux densities up to 20,000 lines per sq. cm. in ensuring that the electromotive force in the windings of the tester should be of true sine wave form. He showed that the divergence was mainly due to the presence of higher harmonics in the magnetising current, and described a method of compensating for this by providing by separate windings the necessary neutralising E.M.F.'s of higher frequency either by a short-circuited mesh winding, introducing a triple-frequency harmonic or by a separate alternator, with suitable instruments for revealing the correctness of the conditions. Certain correction factors were gone into, and the Paper presented an interesting account of a painstaking research.

**The Remuneration of Electrical Engineers.**—In the course of some remarks at a meeting of the Birmingham Local Section of the Institution of Electrical Engineers, Sir John Snell said that he felt that the salaries paid to junior engineers were inadequate, and that—after not only a good practical training but also a good college, and possibly also a university training involving years of work and much expense—engineers had a right to expect higher remuneration, and not some paltry sum of 25s. a week. He hoped that by attention to this matter the Institution might be successful in bringing about an improvement in this respect. Electrical engineering involving, as it did, a prolonged and scientific training, was as much a learned profession as that of the law, and he asked for the co-operation of all the members to bring about a proper recognition of the status of electrical engineers.

**"La Lumière Electrique."**—This fortnightly journal, the publication of which has been suspended since the beginning of August, owing to the mobilisation of the editorial staff, will resume publication to-morrow.

## AMERICAN RATING OF ELECTRICAL MACHINERY

THE new standardisation rules of the American Institute of Electrical Engineers, which took effect on Dec. 1st last, are voluminous in their completeness, and much in them will be agreed with as satisfactory and in accordance with the best interests of the electrical industry. There are, however, one or two points especially in connection with the rating of electrical machinery by temperature which we should like to comment on.

Looking back on the development of the subject in previous codes of rules, it will be remembered that the original German rules specified simply a limiting temperature rise above that of the atmosphere for an air temperature not exceeding 35° C., and that these figures (ranging from 50° C. to 80° C. for different classes of insulation) were somewhat higher than the ordinary 70° F. (21° C.) which was the prevailing British practice at the time. Certain definite percentage short-period overloads were also standardised. The newest German rules retained the same temperature rises, but sought to make the matter more definite by adding maximum temperature not to be exceeded even on overloads. This fixing of the maximum temperature was embodied in a more definite form in the rules of the International Electrotechnical Commission at its Berlin Conference, and the definition of overload was then altered in a way which virtually abolished temporary overloads and substituted a maximum rating dependent on the limiting temperature, whatever the temperature of the surrounding air. It is this system that has been adopted in the American rules.

The introductory clause on heating and temperature says that the capacity of electrical machinery "is usually limited by the maximum temperature at which the materials in the machine may be operated for long periods without deterioration. . . . The result of operating at temperatures in excess of the safe limit is to shorten the life of the insulating material." The way in which the limiting temperature is regarded as a definite point above which damage may be done, and below which the insulation will not suffer is seen in the next paragraph, which begins:—"There does not appear to be any advantage in operating at lower temperature than the safe limit as far as the insulation is concerned." We know of tests of insulating material heated for long periods at various temperatures which do not bear out this view. It is insisted strongly that "the actual temperature attained . . . and not the rise in temperature, affects the life of the insulation"; but we question whether the effect on a machine heated through a considerable rise from a low air temperature is the same as on a machine in a hot atmosphere heated comparatively few degrees, and those with a much less temperature gradient between the hottest spot and the surrounding air.

The maximum permissible "hottest spot" temperatures are given as 95° C. for (A1) "cotton, silk, and other fibrous materials not so treated as to increase the thermal limit"; 105° C. for (A2) similar materials treated or impregnated and including enamelled wire; and 125° C. for (B) mica, asbestos, and other materials capable of resisting high temperatures in which any Class A material or binder, if used, is for structural purposes only, and may be destroyed without impairing the insulation or mechanical qualities. The limits of temperature rise permitted under rated load conditions are found by subtracting 40° C. from these figures, and these are given in the second column of the table in the rules. "Whatever be the ambient temperature," continues the rule, "at the time of the test, the rise of temperature observed must never exceed the limits in column 2 of the table." This relates to test conditions, but it would appear that the purchaser may load his machine up to the maximum temperature, whatever the air temperature, and thus obtain a larger output when the weather is cold. This is regarded as an advantage in some comments in the *Electrical World* (New York), but we do not think it would be appreciated by all contractors during the maintenance period. A correction of 15° C. is to be made in arriving at the true "hottest spot" temperature from thermometer readings, so that the limiting temperatures by thermometer become 80°, 90°, and 110° C. respectively. Other corrections are given for resistance and thermo-couple observations.

The maximum temperature allowed on commutators is considerably higher than has hitherto been permitted in any rules, being 130° C. for currents of 200 amperes per brush arm, with 5° C. less for each additional 100 amperes per brush arm up to 900 amperes, for which current and over, 95° C. is the figure. These lower values for the larger sizes form a slight concession to the difficulties due to expansion

of the segments, but the main trouble will be to obtain satisfactory brush material to work at these temperatures, and to avoid expansion effects in the fit of the brushes in the holders. It is also specified that no part of the machine subject to handling shall have a temperature exceeding 100° C., except for a very short time. We should not like to lay hold of brush rocker handles at such temperatures even for a very short time.

## ELECTRICITY IN THE PRINTING OFFICE

A PAPER on this subject by Mr. F. Broadbent was read before the Association of Engineers-in-Charge on Dec. 9th. The author first reviewed the question of lighting at some length, favouring the provision of a moderate degree of general illumination amounting to not more than half that required on the working surfaces by high candle-power metal-filament lamps placed high up, and supplementing this by means of screened localised lamps immediately over the work. It was important not to go to either extreme in illumination. Small print, he said, was indistinguishable at 0.1 to 0.2 foot-candles, most easily deciphered with an illumination of 2 to 4 foot-candles, but was again indistinct at 8 to 10 foot-candles. Among miscellaneous applications of electricity in printing works was the production of electrotypes and the nickel-plating of stereo and other plates by electro-deposition. Electrical apparatus was also used to neutralise the static charge given to the paper in some fast-speed printing machines. The most important application was the electrical driving of the machines, which, owing to the nature of the work, was not only far more economical than mechanical driving, but produced better work and increased the output per machine. He was greatly in favour of individual drive for even the smallest machines, on the grounds of economy, convenience, and cleanliness due to absence of shafting and belts, and independent speed control.

Turning to the driving of actual printing machines, he showed typical power curves of Wharfedale and other patterns of flat-bed machines. These were best driven by compound-wound interpole variable speed motors, fastened to the actual frame of the machine, through suitable belts or gearing. The ordinary hand form of starter could give good results in exceptionally careful hands, but push-button control was generally preferable, both for presses of this kind and many of the miscellaneous machines used in the foundry.

In city newspaper work, where time is one of the principal objects, electricity plays an extremely important part, and is employed in practically every process from the delivery of the news by telegraph or telephone to delivery of the finished paper in the street. In a large rotary press there are hundreds of moving parts, amounting in the aggregate to tons of moving machinery which must be started gently and run at a very slow rate to permit of the paper strip or web being threaded between the rollers. Very smooth and gradual acceleration is necessary also to prevent breakage of the web. When once fairly started the machinery must be quickly run up to speed, without jerk or jar of any kind, until the machine is travelling at a rate sufficient to turn out from each deck from 24,000 to 34,000 copies of the paper per hour. Arrangements must also be made to couple the different decks or sections of the machine together, so that they shall start up and accelerate simultaneously from any one of the many push-button control stations located at different points on the press.

Except in very small sizes, rotary presses cannot be satisfactorily driven by the ordinary methods adopted for driving other kinds of machinery. The two principal systems are single motor drive with diverter control for the slow speeds and the double motor system. In the former a very heavily compounded motor is generally used. To start up, current is supplied through a resistance, which is gradually cut out until the motor starts. As soon as it has acquired, say, 5 per cent. of its full speed, the voltage across the armatures excites an automatic switch which connects the diverter resistance across the armature terminals. In this condition the armature cannot accelerate, as any tendency to do so would increase its back E.M.F. and divert more current into the diverter resistance. The next movement of the controller gradually increases the diverter resistance, the speed increasing until creeping speeds are passed, when the diverter circuit is broken and the machine runs as a plain compound-wound motor with armature resistance in circuit. The armature resistance is then gradually cut out, and after that the compound winding is cut out or diverted, the motor then running as a plain shunt motor. Further increases of speed are obtained by plain shunt regulation.

In the two-motor system a small auxiliary motor is geared

by a worm gear to the main, and takes the drive at the lowest speeds, and a free-wheel or self-releasing clutch is provided to permit the large motor to overrun the small one when the higher speeds are reached. The control of both motors is done by one controller, which is usually actuated by electromagnetic means by push-buttons about the machine. In the Ward-Leonard system a variable voltage is applied to the main motor from a motor-generator regulated entirely by field control. The "M. E." system depends on an electromagnetic slipping clutch, and the Mascord system employs a mechanical reducing gear, put in and out of action by a magnetic clutch.

## REVIEWS OF BOOKS

*We shall be pleased to post any of the undermentioned works to any address in the United Kingdom, Colonies, or Abroad at the prices given. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-6 Temple Chambers, Temple Avenue, London, E.C., accompanied by a remittance.*

**Telegraphy.** By the late Sir W. H. Preece, K.C.B., F.R.S., and Sir J. Sivewright, K.C.M.G. Revised and partly re-written by W. L. Preece. 422 pp. 8½ in. by 5½ in. 269 figures. (London: Longmans, Green & Co.) 7s. 6d. net; abroad, 8s. 2d.

Our old friend "Preece and Sivewright," which was first published nearly forty years ago, and ran through many succeeding editions, was long the standard work to which one always turned when in search of information on matters telegraphic, and many will welcome the present revised and enlarged form which has been produced by Mr. Llewellyn Preece. The work was always intended to be addressed to the student rather than to the trained engineer, but in the early days the most advanced methods of telegraphy were such as to be easily intelligible to the student, and incidentally the book was a pretty complete treatise of telegraphy as then practised. Now, however, things are different, the growth of traffic has rendered more complicated methods necessary, of which the intricacies cannot be detailed in an elementary text-book. The earlier, simpler methods, however, are still largely practised in the more sparsely populated districts of the Colonies, India, &c., and the book, although not pretending to contain an advanced description of the most modern requirements, should prove of considerable use to a large class. Even in the increased size of volume adopted it has not been found possible to find room for a treatment of all the directions of modern developments, and the reviser reluctantly decided to omit the very large subject of submarine telegraphy, and confine the main portion of the book to land telegraph work. There is, however, a short chapter on telephony—an admirable condensed sketch of up-to-date practice—and another on wireless telegraphy equally suggestive and free from redundant matter.

As is naturally the case, the book has had to be very largely re-written, and to do this while living up to the reputation of the earlier work was a task that required courage to attempt. That Mr. Preece has worthily carried on his father's work in this respect will, we think, be the verdict of the many who will have occasion to study the result of his labours.

**The Elements of Electricity.** By W. Robinson. 596 pp. 9½ in. by 6 in. 374 figures. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 10s. 6d. net; abroad, 11s. 6d.

This volume is by a professor of chemistry in the United States Military Academy at West Point, and has been prepared primarily for the use of American military cadets; but its arrangement is such as to make it useful to anyone desiring a general knowledge of electrical phenomena. After a brief introduction, the traditional, but not to everyone's mind the best, order of things is observed, and electro-statics is dealt with at some length, but without much mathematical theory, in eleven chapters. Following these the author treats of magnetism as far as is convenient considering that the student knows as yet nothing of electric currents. In the next chapters, however, he learns of the production of current from batteries, primary and secondary, but it is not till nearly the middle of the book that he is introduced to Ohm's law, although his ideas on electro-chemistry are getting advanced. Up to this point the treatment is a little long-winded, but in the next part, entitled, "Electro-magnetics," is somewhat speeded up. It connects up the ideas already acquired, and in this section are discussed heating effects, welding, arcs, furnaces, incandescent and other electric lamps, thermopiles and electrical units, while dynamos, motors, alternating

current, &c., are treated in the fifth part, entitled "Electro-mechanics." By this time the author is evidently short of space, and in a very brief but suggestive final portion on "High Potential," he treats rapidly of discharge of electricity through gases, electrical oscillations, and wireless telegraphy. The student will derive much knowledge from a perusal of this work, which in many ways is original, sound, and well written, even if it is a little unsatisfactory, as an instrument of education, in the sequence of the subject-matter, and its sense of proportion between the academic and the practical, the ancient and the modern.

**Laboratory Manual. Direct and Alternating Current.** By C. E. Clewell. 100 pp. 9½ in. by 6 in. 27 figures. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 4s. 6d. net; abroad, 4s. 10d.

Thirty experiments are given in connection with D.C. and A.C. circuits, apparatus, and machinery. They have been chosen for the use of students in courses, other than electrical engineering, who take a brief amount of work in the fundamental principles of electricity. After the purpose of the experiment is stated, there is an exposition of the theory underlying it, then follow instructions for carrying out the work, with diagrams of connections, and then suggestions for making out the written report. The experiments are well chosen, having regard to the class of student for whom they are arranged, as they are all of a practical nature and are carried out in commercial types of apparatus. Each has direct bearing on articles in the text-book—"Elements of Electricity," by W. H. Timbie—and a list of these articles is given at the beginning of the description of each experiment. Provided, however, that a laboratory is properly staffed, it is doubtful whether the use of such a manual is advantageous to the students, as it may tend to make the carrying out of the tests more mechanical than should be encouraged.

**Continuous- and Alternating-Current Machinery.** By J. H. Morecroft. 466 pp. 7½ in. by 5½ in. 288 figures. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 7s. 6d. net; abroad, 8s. 1d.

The author, who is Assistant-Professor of Electrical Engineering at Columbia University, has handled his subject in a very lucid manner. The book commences with a chapter on elementary principles of direct currents, and the reader is then made acquainted with the essential parts of dynamo-electric machinery, and then the principles underlying their operation. The treatment is thoroughly up-to-date, and several interesting charts and tables which materially aid the student are given. A chapter on efficiency concludes this part of the book. The principles of alternating currents are next dealt with, graphical methods being used to illustrate the reasoning wherever possible. This will probably be welcomed by the majority of readers in preference to the more rigid mathematical proofs which had to be mastered in the earlier books. The general construction of A.C. machinery, including alternators, transformers, and various types of motors and converters, is described in the succeeding 200 pages, which also contain a clear description of the Tirrill regulator. The last three chapters deal with polyphase power, auxiliary apparatus, and operation and care of electrical machinery, and will be particularly appreciated by those whose duties are connected with the generation of electric power.

**The Pocket-Book of Illumination.** By J. Eck. 85 pp. 6½ in. by 4½ in. 32 figures. (London: S. Rentell & Co., Ltd.) 1s. net; by post, 1s. 2d.

Mr. Eck has given us a useful little manual on illumination, dealing with the subject clearly and practically, without going into theory or mathematics. He emphasises particularly the claims of indirect lighting, giving attention principally to the use of arc lamps for this form of illumination, and many striking examples of this method, as well as of direct and indirect lighting by incandescent lamps, are illustrated. Tables are included from which the illumination produced by various arrangements of lamps can be ascertained, which will be useful in settling the spacing to be adopted in planning installations. The work relates principally to the illumination of industrial premises, and does not deal to any great extent either with private house or street lighting.

**X-Rays: An Introduction to the Study of Röntgen Rays.** By G. W. C. Kaye. 252 pp. 8½ in. by 5½ in. 97 figures. (London: Longmans, Green & Co.) 5s. net; abroad, 5s. 6d.

The name of the author, who is now head of the Radium Department of the National Physical Laboratory, is a guaran-

tee of excellence in the treatment of the subject, and the value of the book lies particularly in its descriptions of modern practical methods and apparatus, such as are used in medical work. The scientific side has, however, been by no means neglected, and an admirable sketch of the progress from Röntgen's original discovery in 1895 down to the end of last year. A great deal of valuable material has been brought together from scattered sources, and in addition to the historic and practical treatment to which we have already referred, there are most interesting chapters on other properties of Röntgen rays and theories as to their nature.

**Electric Traction.** By L. Calisch. 116 pp. 8 in. by 5½ in. 36 figures. (London: Locomotive Publishing Co., Ltd.) 2s. net; by post, 2s. 3d.

We have in this little book a reprint of a series of articles on electric traction on railways which appeared in the *Great Eastern Railway Magazine*. The author handles the subject with ability and clearness, and gives a very readable sketch of the present position of electric traction as applied to ordinary railways. He explains in what circumstances it can best compete with steam, describes the main features of the direct current, single-phase, and three-phase systems, and gives specially interesting chapters on electric locomotives and multiple unit control. These technical parts of the book are well illustrated with examples of modern practice; and last but not least in importance is a discussion of the economic side of the question, with a collection of actual costs of working.

**Drawing for Electrical Engineers.** By G. W. Worrall. 92 pp. 8½ in. by 5½ in. 70 figures. (London: G. Routledge & Sons, Ltd.) 2s. net; by post, 2s. 3d.

This work, which is one of the "Broadway" series of textbooks of technology, does not, as its title might be thought to imply, deal with the technique of draughtsmanship, but is really a practical handbook of mechanical design of dynamos and motors. It deals seriatim with bearings, shafts, rotors and stators of induction motors, D.C. armatures, commutators and magnet frames, brush gear and slip-rings. A very large number of dimensioned drawings of machine details appear, all taken from typical modern practice, and valuable quantitative data, as well as generalisations of principles, are contained in the text.

**Principles and Practice of Electrical Engineering.** By A. Gray. 391 pp. 9½ in. by 6½ in. 449 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.

This work is based on a lecture and laboratory course to senior students at McGill University, but can neither be classed as an elementary nor as an advanced book. It does not go deeply into mathematical nor theoretical considerations, but the general principles are illustrated throughout by the most up-to-date applications, and the work is, perhaps, more a manual of practice than principles. The laboratory course occupies a short section at the end, and is scarcely on a level with the rest of the book. A wonderful deal of information is included spreading over a considerable range of electrical engineering matters, including alternating-current working and electric traction.

**Elementary Magnetism and Electricity.** By C. M. Gansky. 212 pp. 9½ in. by 6½ in. 121 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 6s. 3d. net.

This book differs somewhat from the ordinary book of its class in that it contains a number of illustrations, together with appropriate descriptions, showing the practical applications of the subject. Throughout the book, simple laboratory experiments are used as a framework, on which the theory is built up. The examples are rather few in number, and in every case the solution is given immediately below the question. If in some cases the student had been asked to solve the problems himself, he would probably get a more thorough grasp of the subject. In the first four chapters the author treats of magnetism and electromagnetism. The remaining six chapters of the book are devoted to the various applications of current electricity. Of these, the chapter on electrolysis contains an amount of information in a compact form, and a special chapter dealing with the theory of the dynamo and motor gives a clear conception of the basic principles upon which they depend. The recapitulations given at the end of each chapter are a decided addition to the value of the book, which is calculated to meet the needs of anyone who, whilst knowing something of the practical applications of electricity, feels himself to be lacking in a sound knowledge of first principles.

## ELECTRICAL DRIVING IN THE WOOLLEN TRADE

A LECTURE on this subject was given by Mr. J. F. Crowley before the Halifax Textile Society on December 3rd. The woollen trade, he said, has the following peculiarities from the driving point of view:—Small total horsepower required for each factory as compared with, for instance, the jute trade or the cotton trade; particularly poor load-factors, that is, a small percentage of the machinery running at a given instant; a varying trade, which may mean the shutting-down of a number of machines for long periods, or, again, the running of machines at night when trade is brisk. Electrical driving was able to show to great advantage in such circumstances. In comparing group and individual driving, the lecturer said that the simplest method of all was to replace the main engine by a single motor, but it was soon realised that advantage was obtained by dividing the shafting into groups, each driven by its own motor, and the advantages are greater still where the driven units are smaller and when still shorter lengths of shafting are taken. The shafting speeds in woollen factories were usually about 90 r.p.m., and some sort of speed-reduction gear was necessary between the motor and the shaft. Individual driving entailed higher capital cost, but brought advantages of saving in power and increase in production. The transmission losses, which are avoided by individual drive, are very much greater than is commonly supposed, for the increase in friction losses when shafting is loaded up is usually treated as negligible, although it is frequently very large; these additional losses in one test were shown to amount to 91 per cent. of the total light load losses, and in another to as much as 174 per cent. In estimating the saving in power with individual drive, account must be taken of the load-factor, since with individual motors the power-consumption for each machine ceases when the machine stops, while with group driving the whole of the shafting and belting must be run while a single machine is required. If  $N$ =the load-factor of the mill,  $I$ =the power lost with individual drive, and  $G$ =the power lost with group drive, then for these losses to be equal  $\frac{I \times N}{G \times 100}$  must equal 1. If

this formula gives a result greater than 1, then individual driving is at a disadvantage from a transmission loss point of view, while if the result is less than 1, the advantage lies with individual driving. In no case that the lecturer is aware of have individual loom drives with high efficiency motors shown to disadvantage. A weaving shed in Lancashire has a weaving efficiency of 77 per cent. to 80 per cent. for ordinary looms, and approaching 95 per cent. for automatic looms. In the woollen trade, however, 60 per cent. would be an average figure, and it would probably be correct to say that only a high-class shed would reach 66 per cent. The lecturer then passed on to the advantages conferred by the steadiness of the electric drive, which not only results in enabling the speed of the loom to be increased, but reduced stoppages due to breakages of warp and weft, and allowed of much quicker starting after a stoppage. Increases in production of from 10 to 25 per cent. have been recorded.

With regard to the driving of mules, it was sometimes advised that as many mules as possible should be driven by one motor, in view of the great variation in the load, to damp out the speed variations, but the lecturer contended that individual drive was much to be preferred. The really vital point, he said, is that with individual drive the variations in speed that occur simply ease the passage from one stage to another in the cycle of operations, while a constant speed is obtained during the actual spinning period when steadiness of speed is essential. With mechanical drive, on the other hand, or with group electrical drive, the peak loads of a certain group of mules may synchronise and produce a speed variation on the system of serious effect on the other mules, since it does not happen to synchronise with their operations. This point is of far greater moment than an improvement of a few per cent. in actual speed variation itself. Mr. Crowley also included a few remarks on the individual drive of centrifugals, and recommended small three-phase pole-changing motors arranged for regenerative braking.

**The Enemy's Trade.**—The Board of Trade has brought out a further list of articles with respect to which inquiries have been received from firms desirous of purchasing and of selling articles of which the sources of supply have been interfered with by the war. Firms can obtain these lists, and are invited to make inquiries from the Commercial Intelligence Branch, 73 Basinghall Street, E.C.



## QUESTIONS AND ANSWERS BY PRACTICAL MEN

### RULES.

**QUESTIONS:** We invite our readers to send us questions, preferably on technical problems that have arisen in actual practice. Questions which we consider of sufficient general interest to our readers will either be replied to under "Answers to Correspondents," or replies will be invited from our readers. One shilling will be paid for the question which we select for competitive replies in this column.

**ANSWERS:** A fee of 10s. will be paid for the answer which we consider shows the greatest merit, and 5s. for the one we select as second best. Replies should reach this office within seven days of the appearance of the question. In judging the replies, importance will be attached to clearness and conciseness, as well as accuracy. The Editor reserves the right to make no award, or to accept only one reply, if, in his opinion, the answers received do not possess sufficient merit. Competitors desiring the return of their manuscripts, if unaccepted, should enclose stamped addressed envelope.

Write on one side of the paper only, and if diagrams are sent, draw them on a separate sheet of paper attached to the manuscript. Competitors may adopt a "nom de plume," but, both in the case of questions and answers, the competitor's real name and address must be sent with the manuscript as a guarantee of good faith. No correspondence will be entered into with regard to unsuccessful replies. The Editor's decision is final.

#### QUESTION No. 1,423.

In each of two four-pole direct current generators, fitted with four interpoles and three slip-rings for connecting to a three-phase static balancer, the voltage on the two sides of the system differs by about 3 per cent. when the load is balanced (as current in the middle wire), and the brushes are in the neutral position. The series and commutating pole windings are connected one-half on each side of the armature, and the drop of volts across each set is the same. The voltage between each pair of slip-rings is equal.

Explain the cause of the unbalanced voltage, and suggest remedy.—KORL.

(Answers must be received not later than first post Thursday, Jan. 7th.)

#### ANSWERS TO No. 1,421.

In the old days the mistake was sometimes made of drawing more than one cable into the same duct. Is there any known method, short of cutting the cable, of finding out whether a concentric cable carrying alternating current, 2,000 volts, single-phase, is "alive" or "dead"?—R. McC.

An award of 10s. is given to V. F. Bush for the following reply:—

It is well known that there is an alternating magnetic field surrounding a live cable carrying alternating current, and this

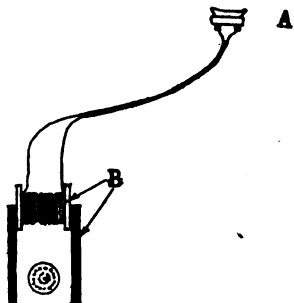


FIG. 1.

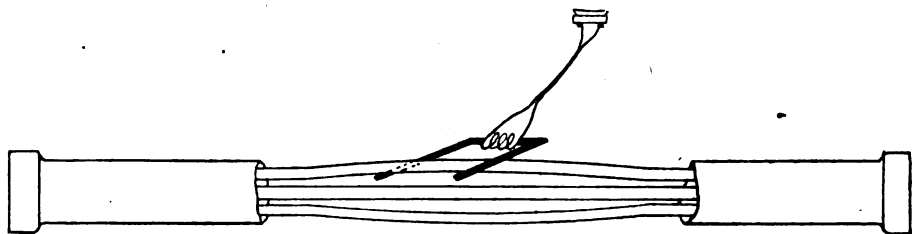


FIG. 2.

fact is made use of, for our purpose, in the following manner. If a coil of insulated wire is brought in proximity with the cable the magnetic field induces a current in the insulated coil, which will produce a loud buzz or hum in a telephone receiver connected to the coil. Figs. 1 and 2 show diagrammatically the apparatus and method of use. A is an ordinary telephone receiver, and B a coil of, say, 10 layers of No. 28 S.W.G. double cotton-covered copper wire, wound for a distance of 3 ins. in the middle of a piece of soft iron 12 in. in length,  $\frac{1}{4}$  in. thick, and  $\frac{3}{4}$  in. wide, afterwards bent channel-shaped as shown in the sketch. In using the device it would be advisable to open out about two lengths of duct, say, 4 ft., and spread the cable as much as possible, to prevent appreciable interference from the stray flux of adjacent cables; or a sheet of soft iron could be held between the cables. There

will be no difficulty in distinguishing the live and dead cables; the telephone gives a very distinctive hum, which can be heard some distance from the telephone receiver. Before using, it would be advisable to test the apparatus with a battery to make sure that the circuit is not broken, as one cannot be too sure when working on H.T. cable.

No second award is made.

It may be mentioned that the inductive effect is to some considerable extent diminished by the two conductors of the cable being concentric, but in most cases a hum would be heard in the telephone. A triangular search coil of a much larger size than the coil illustrated would be more sensitive. As the cables are near together, it is possible that a hum in the telephone, although of less intensity, would be heard in the case of the dead cable also, especially as capacity or leakage currents through the lead sheaths would divide themselves among the various cables which are in external contact, and it is even not altogether impossible, in these circumstances, that the hum obtained from the dead cable might not be the faintest. The test should, therefore, be regarded rather as a guide than as an absolute indication of which is the live and which the dead cable; and the lead sheath and outer insulation should be removed by a rubber-gloved man, and the outer conductor tested to see if it is carrying current, before the cable is cut through.—Ed. E.E.

### NEW PUBLICATIONS

We shall be pleased to post any of the undermentioned works to any address in the United Kingdom, Colonies, or Abroad at the prices given. Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-6 Temple Chambers, Temple Avenue, London, E.C., accompanied by a remittance.

"Principles and Practice of Electrical Engineering," by A. Gray. 391 pp. 9 $\frac{1}{2}$  in. by 6 $\frac{1}{2}$  in. 449 figures. (New York: McGraw-Hill Book Co.; London: Hill Publishing Co., Ltd.) 12s. 6d. net.

"Mechanical World" Electrical Pocket-Book for 1915. 240 pp. 6 $\frac{1}{2}$  in. by 4 $\frac{1}{2}$  in. 130 figures. (Manchester: Emmott & Co., Ltd.) 6d. net; by post, 8d.

"American Handbook for Electrical Engineers." Edited by H. Pender. 2,023 pp. 7 $\frac{1}{2}$  in. by 4 $\frac{1}{2}$  in. 891 figures. (New York: John Wiley & Sons; London: Chapman & Hall, Ltd.) 21s. net; abroad, 21s. 10d.

### THE POSITION OF THE BRITISH ELECTRICAL INDUSTRY

At a meeting of the Sales Managers' Association on Dec. 17th, Mr. H. Scholey, of Messrs. Scholey & Co., gave an address on the "Position of the British Electrical Industry and Methods of Extension in the Markets of the World." After reference to the unfortunate company promotions which followed the passing of the Electric Lighting Act of 1882, and the undoubted effect which these had upon the electrical industry in subsequent years, he dealt with the manufacturing side of the industry. The larger firms and manufacturers, he said, were able to compete in any part of the globe, but they were apt to be satisfied with a comparatively small enterprise, and did not

develop on a scale which would take them into the bigger and broader markets. An instance of this was the electric carbon industry. At the same time very few of these large manufacturers, whilst turning out a product second to none, had paid dividends for years on their ordinary capital due partly to the severity of competition from both home and abroad. There were other causes, however, and the chief of them was that the largest purchasers, being municipalities or great corporations such as railway companies, imposed conditions in their tenders which they were not able to impose upon the foreign manufacturer and frequently waived these conditions in accepting a foreign tender. The situation created by the war, however, gave the British electrical manufacturers their opportunity, but there would have to be co-operation and co-ordination among them if they were to take advantage of it.

## TELEPHONY AND TELEGRAPHY (INCLUDING WIRELESS)

An official return from the International Telegraph Bureau at Berne states that on June 15th last there were in Europe 210 coast wireless stations and 2,947 ship stations (including 1,158 on warships). Of these Great Britain had fifty-four coast and 1,814 ship stations, Germany seventeen coast and 564 ship stations, and France nineteen coast and 812 ship stations. The Asiatic stations are given as forty-six coast (including sixteen in the Philippines and eleven in India) and 105 ship stations (ninety-eight, including sixty-five on warships, belonging to Japan). Africa had a total of fifty-four (including one ship), and the North and South American stations are given as totalling 241 on the coast and 918 on ships. This includes ninety-one coast and 689 ship stations in the United States,

and forty-seven coast and sixty-one ship stations in Canada. Australia and the Pacific account for thirty-six land stations and sixty-three ships, mostly belonging to Australia and New Zealand, and including nineteen Australian warships. It is interesting to note that the German Colonial stations are given as eight. The grand total, including both ship and shore installations is 4,620.

The Cayenne-Salinas cable of the French Cable Company was down on the 16th inst., and on the following day that between Singardja and Amperan was restored.—Code language is prohibited *via* Galveston to all places in Mexico excepting Vera Cruz.—The Indo-European Telegraph Company state that offices are open at Fao and Busreh in Turkish Asia for international traffic in plain language.—The cable between Madagascar and La Réunion has been repaired.—Owing to the severe storm of the 28th inst., delay was notified to all places in the provinces, Scotland, and Ireland, and telegraph companies were put to much inconvenience owing to the Irish lines being down, as well as the telephone system being generally disorganised and interrupted.

## "ELECTRICAL ENGINEERING" PATENT RECORD

(This Patent Record is compiled by our own Editorial Staff and is Strictly Copyright.)

### Specifications Published Dec. 24th, 1914

A full list of electrical patents published last week appeared in our last issue. The following are abstracts of some of the more important specifications.

Names in italics indicate communicators of inventions from abroad.

20,806/13. **Wireless Telegraphy.** F. MILLER. Apparatus for generating electric waves, comprising two oscillatory circuits, one of which contains a spark-gap and is used as the primary, while the other is used as the antenna circuit. These circuits are disposed in such a way as not to influence each other directly they are attuned to each other. A third oscillatory circuit is coupled between them inductively or directly, but is not in tune with them, but has a natural period greater than either. (Two figures.)

26,447/13. **Field Telephone.** R. C. FREEMAN. A travelling cable reel for laying and taking up field telephone cables, in which the reel is rotated by the action of the road wheels. Provision is made for electrical connection between the reel and the cable and a portable telephone, and the return earth circuit is through one road wheel. The reel can be discarded without cutting the cable. (Three figures.)

29,984/13. **Feeder Protection.** B.T.-H. Co., J. WHITCHER, and E. B. WEDMORE. A protective system in which the feeder is composed of parallel connected sections, one surrounding the other. The relays and trips are arranged on a balance principle, the current in the two parts of the feeder normally balancing. Disconnection is effected when the current in the outer section predominates. The inner conductor may be of smaller section than the outer, and the balance relay may be set with a bias in favour of the inner conductor. (Two figures.)

4,359/14. **Starting Rotary Converters.** B.T.-H. Co. and F. P. WHITAKER. Starting is effected by an induction motor. At first the stator winding of the motor is connected in series with the armature of the converter. When the field has been built up, auxiliary reactances are placed in parallel with the stator winding of the motor, and finally, when synchronism is attained, both stator winding and reactance are short-circuited. (One figure.)

### Specifications Published To-Day

The following Patent Specifications will be published to-day, and will be on sale at the Patent Office Sales Branch, 25, Southampton Buildings, London, W.C., at the price of 8d. each, post free.\*

Summaries of some of the more important of these Patents will appear in our next issue.

**Electrometallurgy and Electrochemistry:** SNYDER [Electric furnaces] 25,171/13; BOISSIER [Suspension of anodes] 11,610/14; COUTAGNE [Nitride furnaces] 12,057/14.

**Heating and Cooking:** PATE and WOOD [Heating apparatus] 12,605/14.

**Incandescent Lamps:** RHODES [Variable candle-power lamp] 24,871/13; PETTINGILL [Bulbs] 4,590/14.

**Batteries:** SIMMONS [Dry cells] 1,972/14.

**Switchgear, Fuses, and Fittings:** STATTER [Tripping devices] 28,111/13; HAYWOOD [Controllers] 28,292/13; AMBERTON [Control gear] 28,527/13; WESTERN ELECTRIC Co. (Woodward for W.E.

Co., U.S.A.) [Control apparatus] 1,154/14; BERETTA [Switches] 3,530/14; IGRANIC ELECTRIC Co. (Cutler Hammer Mnf. Co.) [Controlling devices] 3,650/14.

**Telephony and Telegraphy:** SARGENT [Telegraphy] 28,409/13; MARCONI'S WIRELESS TELEGRAPH Co. and ROUND [Wireless receivers] 28,413/13; MURRAY [Tape transmitter] 28,559/13, and [Driving of multiplex distributors] 3,436/14.

**Traction:** RENAULT [Car lighting dynamo control] 27,477/13.

**Miscellaneous:** A. G. BROWN, BOVERI ET CIE [Vapour rectifiers] 186/14; OLDFHAM [Locking apparatus for miners' lamps] 2,249/14; COLLINSON [Resistances] 7,677/14; MELLERSH-JACKSON (Interstate Electric Novelty Co., U.S.A.) [Battery lamps] 11,920/14; CAMPBELL [Electrically worked ash hoist] 15,224/14.

The following Specifications are open to inspection at the Patent Office before Acceptance, but are not yet published for sale.

**Distribution:** APPAREILLAGE GARDY SOC. ANON. [Junction boxes] 23,571/14.

**Ignition:** JACOBSEN and anr., 21,510/14.

**Incandescent Lamps:** WESTINGHOUSE METALLFADEN GLUH-LAMPENFABRIK GES., 25,136/14.

**Instruments:** LINCOLN [Volt-ampere meters] 22,487/14.

**Storage Batteries:** JACOBSEN and anr. [Charging] 21,509/14.

**Telegraphy and Telephony:** OLSSON and anr. [Telephone repeaters] 22,937/14; DIXON [Telegraph systems] 23,380/14.

**Traction:** JACOBSEN and anr. [Starting and ignition systems] 21,512/14; RENAULT [Starting and car-lighting system] 23,444/14.

**Miscellaneous:** A.E.G. (Berlin) [Transformer connection for three-phase vapour rectifiers] 23,505/14.

### Opposition to Grant of Patent

29,059/13. **Sparkign Plugs.** C. SPADA. A grant has been allowed, in spite of opposition, on this specification, which describes sparking plugs with the head arranged so that it can be rotated to clean the points.

### Expiring and Expired Patents

The following Patent expires during the current week, after a life of fourteen years:—

23,878/00. **Ore Separators.** L. I. BLAKE and L. N. MORSCHER. In these separators powdered materials of different conductivities are separated by passing in a stream through an electrostatic field.

The following are the more important Patents that have become void through non-payment of renewal fees.

**Dynamos, Motors and Transformers:** A. MAGNUSON [Three-phase motor control] 18,125/05; M. MILCH [Variable speed induction motors] 20,743/09; C. B. WALKER [Quick action multiple contact switch] 20,786/09.

**Incandescent Lamps:** Z. ELECTRIC LAMP SYNDICATE (H. Zerning) [Metal filaments] 20,223/07.

**Switchgear, Fuses and Fittings:** M. STIPKOVITSCH [Signs] 19,037/08; R. S. WOODS [Electroliers] 19,183/08.

**Traction:** DRICK, KERR & Co., LTD. (Braun) [Magnetic track brake] 20,845/09.

**Miscellaneous:** OTIS ELEVATOR Co. (Otis El. Co., New York) [Automatic starter for lifts] 18,155/01.

\* It is announced that from to-morrow, the price of printed specifications will be 6d. each, including inland postage, instead of 8d. as at present.



## "ELECTRICAL ENGINEERING" TRADE SECTION

### AUTOMATIC ROOM AND WATER HEATERS

ON a recent visit to Glasgow we were shown, by Messrs. A. Schonfield & Co. (21 Hope Street), a pleasing design of electric stove, and also a thermostat device for maintaining room temperature constant and a water-heating arrangement on the same principle. These have been adopted by the Glasgow Corporation Tramways Department, who have 26 of the stoves in use at their offices (half of them

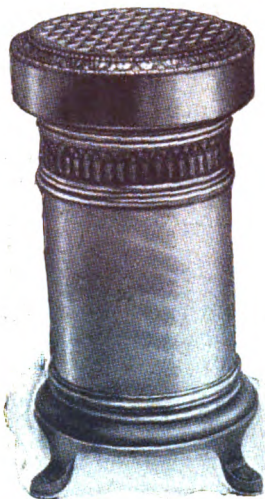


FIG. 1.—THE "HESTIA" STOVE.

with the patent thermostat), and also a water-heating installation supplying 10 to 15 basins in the lavatory.

Fig. 1 shows the general appearance of the stoves for the offices. They consist of an iron foot upon which rests a cylinder of ruby glass with lamps inside, and above this is a perforated metal top. Just inside the top is a removable annular trough, which is filled with water to keep the air moist. The dimensions of the stove are 22 in. high by 12 in. diameter, and the power taken is 3 kw. each in the largest

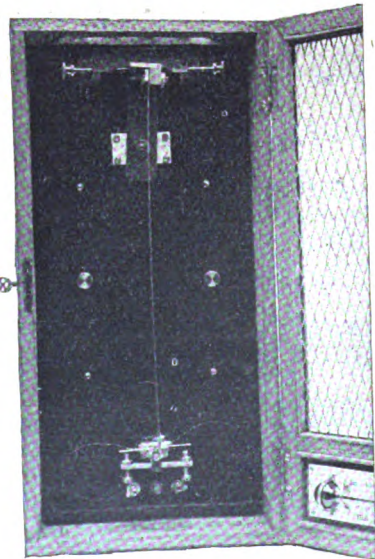


FIG. 2.—THE THERMOSTAT.

size. The heating element is a spiral of resistance wire wound on a spiral core of soft refractory material.

The thermostat and automatic switch used in connection with the stoves are shown in Figs. 2 and 3 respectively. The bi-metal strip of the thermostat (on the "Grundty" principle) is adjusted to hang straight at the temperature it is desired to maintain (60° F. in the case of the tramways offices), and deflects to one side or the other when this is

exceeded or diminished by  $\frac{1}{2}^{\circ}$ . It then pushes over a rocker, which actuates the automatic switch. The latter is of the mercury type. The main heater circuit is made in two mercury cups seen on the right. As soon as the switch goes over, current is cut off from the coil circuit by the action of a small amount of mercury, in the glass tube seen above the coils, which, when the tube is tipped, rolls away from two contacts at one end corresponding to the coil just put in action, and joins two corresponding contacts for the other coil at the other end. The tube is about 4 in. long and  $\frac{1}{2}$  in. diameter, and the contacts are of platinum; a special oil in the tube ensures a clean break. It is estimated that con-

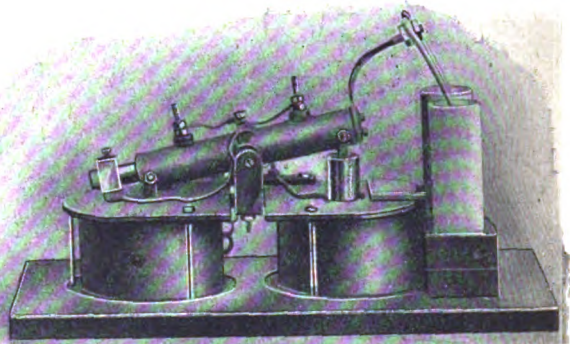


FIG. 3.—THE AUTOMATIC SWITCH.

siderable saving in current will be effected by this means of regulation.

A similar thermostat (but, of course, set to a higher temperature) is used in connection with the hot water supply mentioned. A 20-gallon tank, which is well lagged, has a heating element at the bottom. Three heats corresponding to 17, 6, and 4 amperes at 250 volts are provided, controlled by a 3-way switch, but the thermostat will simply switch on or off in accordance with the temperature of the water. The thermostat is not actually in the water, but is enclosed in a tubular chamber, one end of which is fixed into the tank, and acquires its temperature by conduction from the metal.

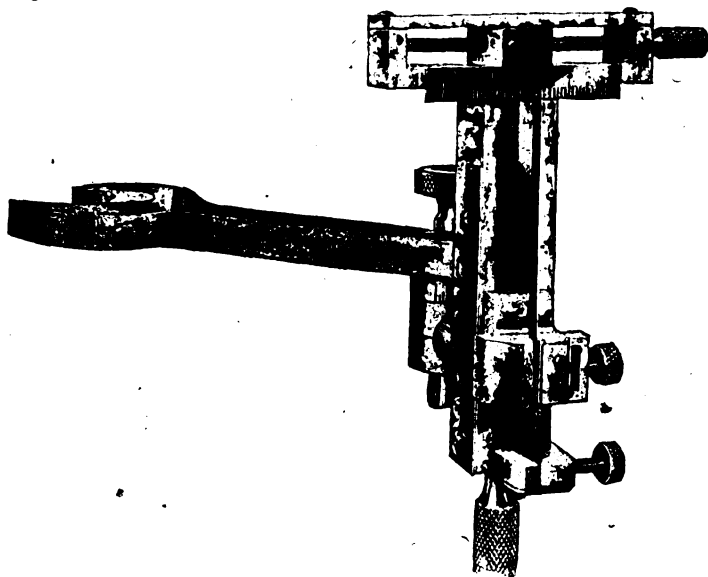
### GERMAN ELECTRICAL TRADE IN RUSSIA

THE Board of Trade Journal publishes extracts from a Russian paper communicated by the British Consul-General at Moscow regarding the investment of German capital in the electrical industry in Russia. The group of closely united German electrical firms have established practically a monopoly in Russia, and the capital of these Russo-German companies is given as follows:—A.E.G., £1,270,000; Siemens & Halske, £530,000; Siemens-Schuckert, £1,585,000; United Cable Factories, £635,000; Polish Siemens Electrical Co., £105,000; "Volta" Share Company, £111,000. The report of the Russian A.E.G. for 1913 states that, "thanks to a whole series of orders from Government and private establishments, the activity of the company has been very considerably extended. The number of fulfilled orders exceeds by 25 per cent. the turn-over of the previous year, while the number of orders in hand exceeds the total turn-over for 1913." The reports of the other companies bear witness to similar successes. An illustration of the German methods of combination may be taken from a protocol of a general meeting of shareholders of the United Cable Factories, from which it appears that of a total of 19,200 shares (of 250 roubles each), 6,235 shares are held by Siemens & Halske, 6,120 shares by the Allgemeine Elektrizitäts Gesellschaft, and 6,120 shares by Felten & Guillaume. This same United Cable Factories also belongs, together with three other enterprises, to the so-called "Abnehmer Syndicate," a syndicate of consumers of copper, which in its turn has contract relations with the Russian copper syndicate "Mied." German capital is also directly interested in a whole series of electrical concerns in Finland, and in this connection it is interesting to note that the realisation of Finnish municipal loans in Germany generally included conditions whereby all municipal orders were to be given preferentially to German firms.



## THE FULLARTON VIBROMETER

AN ingenious instrument for measuring the vibration produced by generating sets or other machinery has been developed by Kelvin, Bottomley & Baird, Ltd., in the Fullarton vibrometer, which is illustrated here. The apparatus is purely mechanical in its action, and depends on the oscillation of a reed tuned to the frequency of the vibrations. The vibrometer is rigidly attached to the machine in question and vibrates with it. It is only 1½ lb. in weight complete, so its own inertia has a negligible effect. The reed is of flat metal clamped permanently at the lower end, and also provided with a sliding clamp, so that the length of the



THE FULLARTON VIBROMETER.

free portion can be varied to tune the reed. A millimeter scale enables the free length to be read off, and the amplitude of the vibration is observable on an adjustable horizontal scale. Provision is made for angular adjustment relatively to the clamping piece, and this takes a convenient spanner-shaped form. The reeds are carefully calibrated, and a set of various different thicknesses each with its calibration curve is supplied with each instrument. Very complete information as to the amplitude, frequency, and direction of vibrations can be obtained by an intelligent use of the instrument, which should be of considerable utility both in settling disputes and verifying quantitative guarantees.

## NEED REDUCED STREET LIGHTING BE SPOTTY?

CONSIDERABLE discussion has arisen recently with regard to the methods adopted for reducing street lighting in conformity with the requirements of the authorities, and Messrs. A. W. Beuttell, Ltd. (109 Victoria Street, S.W.), have sent us an interesting communication on the subject. They doubt whether the existing crude methods of painting

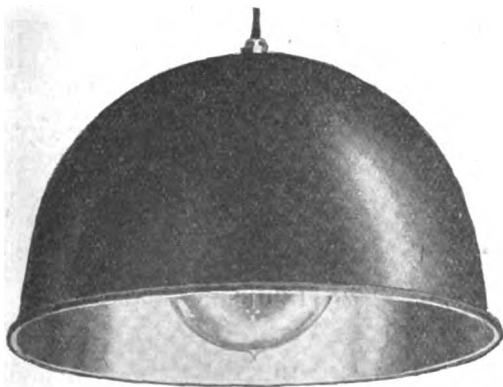


FIG. 1.

the lamp globe or surrounding it by a piece of sacking accomplishes the object sought, viz., reduction of illumination and at the same time giving an irregular and misleading disposition of the brightest units in the main and lesser thoroughfares. The result of obscuring a portion of the lamp globe is a spot of light of great intensity immediately in the vicinity

of the lamp-post, which must be observable from a considerable height. The result of these bright spots of light is also that the users of the thoroughfare emerge from a brightly illuminated space into one of comparative blackness, which itself is a source of considerable danger to fast-moving traffic and users of the roadway generally. They suggest, therefore, the adoption of a reflector which, whilst cutting off the upward rays, would give a minimum illumination over a maximum area, and have designed an aluminium reflector, whose general appearance is shown in Fig. 1. In actual practice the reflector is provided with a suitable opening at

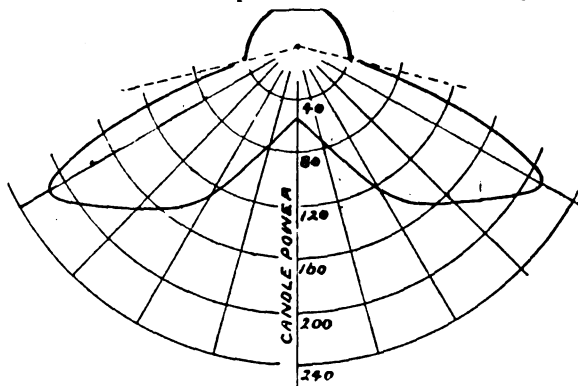
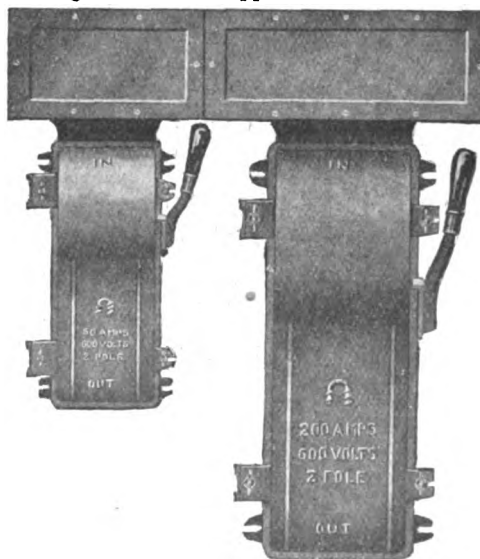


FIG. 2.

the top so that it may be slipped over the existing lamp or lamps and adjusted in the correct relative position thereto. The performance of the reflector is shown from the characteristic light distribution curve given in Fig. 2, from which it will be noticed that it is of the "extra extensive" type with the maximum illumination at an angle of 30°. Messrs. A. W. Beuttell add that they will be pleased to co-operate with central station engineers with a view to adapting the reflector to their individual requirements.

## UNIT SYSTEM OF "SALFORD" SWITCHES

IN order to provide a neat and orderly method of arranging the switchgear when a number of motors are controlled from one point, as, for example, in the motor-room of a wet mill in a cement works, the General Electric Co., Ltd. (of Witton, Birmingham, and 67 Queen Victoria Street, London, E.C.), have developed an attachment which enables their well-known "Salford" switches to be connected up on the unit principle. The attachment consists of a cast-iron box containing horizontal copper bus-bars. These are so



"SALFORD" SWITCHES ARRANGED ON THE UNIT SYSTEM.

constructed that they can be connected up easily and solidly with the bus-bars of adjoining switches so as to form a solid run of bar throughout the whole length of the bank of switchgear. In this way any number of "Salford" switches of the same or different capacity can be connected or disconnected in a short space of time. The attachments are constructed so as to fit easily together, and the principle enables considerable economies to be effected in the cost of wiring up, and, in addition, greatly improves the reliability and appearance of the installation.



# BOOKS

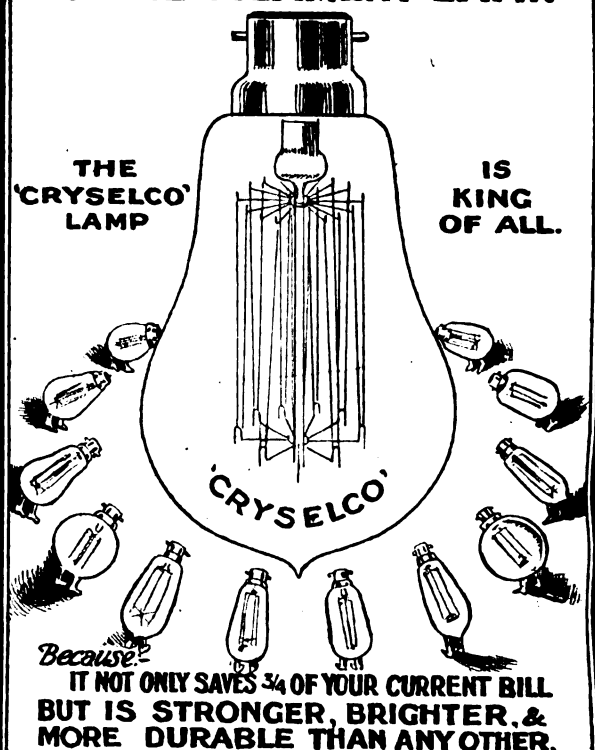
We shall be pleased to send any of the following books to addresses in the United Kingdom at the prices named.

Orders should be addressed to the Kilowatt Publishing Co., Ltd., 203-206 Temple Chambers, Temple Avenue, E.C., and should be accompanied by a remittance.

- Electric Wiring. W. C. Clinton. 3rd ed. 2s. net; by post, 2s. 3d.  
 Electric Light Fitting. S. C. Batstone. 5s. net; by post, 5s. 4d.  
 Electric Circuit. Theory and Calculations. W. P. Maycock. 3s. 6d. net; by post, 3s. 10d.  
 Electric Wiring, Fittings, Switches, and Lamps: Circuits. W. P. Maycock. 6s. net; by post, 6s. 4d.  
 Mechanical World Electrical Pocket Book for 1915. Cloth, 6d. net; by post, 8d.  
 Electrical Tables and Memoranda. S. P. Thompson. 2nd ed. 1s. net; by post, 1s. 1d.  
 Electricity in Factories and Workshops. A. P. Haslam. 7s. 6d. net; by post, 7s. 10d.  
 Ship Wiring and Fitting. T. M. Johnson. 1s. net; by post, 1s. 1½d.  
 Mill and Factory Wiring. R. G. Devey. 2s. net; by post, 2s. 2d.  
 Electrical Mining Installations. P. W. Freudemacher. 2s. net; by post, 2s. 2d.  
 Elektrik Lighting Connections. 3rd ed. 6d. net; by post, 7d.  
 Bells, Indicators, Telephones, and Burglar Alarms, &c. Redfern and Savin. 1s. 6d. net; by post, 1s. 7½d.  
 The Uses of Electricity. Part I. Electric Lighting. 1d.; by post, 2d. Part II. Electric Cooking and Heating. 2d.; by post, 3d. Part III. Works Driving. 2d.; by post, 3d.  
 Simple Electric Cookery. May Little. 1s. 6d. net; by post, 1s. 9d.  
 Electric Cooking, Heating, Cleaning, &c. A Manual of Electricity in the Service of the Home. By "Housewife." 3s. 6d. net; by post, 3s. 10d.  
 Arc Lamps and Accessory Apparatus. J. H. Johnson. 1s. 6d. net; by post, 1s. 7½d.  
 Institution of Electrical Engineers' Wiring Rules, with Extracts from the Board of Trade Regulations and the Home Office Rules for Mines. 6th ed. 6d. net; by post, 7d.  
 Village Electrical Installations. W. T. Wardale. 2s. net; by post, 2s. 2d.  
 Dynamo and Motor Attendants and their Machines. F. Broadbent. 7th ed. 1s. 6d. net; by post, 1s. 9d.  
 Continuous Current Dynamos and Motors and Their Control. W. R. Kelsey. 2nd ed. 7s. 6d. net; by post, 7s. 10d.  
 The Induction Motor. B. F. Bailey. 10s. 6d. net.  
 Foundations and Machinery Fixing. F. H. Davies. 2s. net; by post, 2s. 2d.  
 Storage Batteries. H. W. Morse. 6s. 6d. net; by post, 6s. 10d.  
 Primer of the Internal Combustion Engine. H. E. Wimperis. 2s. 6d. net; by post, 2s. 9d.  
 Suction Gas Plants. C. A. Smith. 2nd ed. 5s. net; by post, 5s. 4d.  
 Diesel Engines for Land and Marine Work. A. P. Chalkley. 8s. 6d. net; by post, 8s. 10d.  
 Junior Magnetism and Electricity. Jude and Satterly. 2s. 6d. net; by post, 2s. 9d.  
 Electrotechnics. J. Henderson. 3s. 6d.; by post, 3s. 9d.  
 Technical Electricity. Davidge and Hutchinson. 3rd ed. 5s. 6d. net; by post, 5s. 10d.  
 A Primer on Alternating Currents. W. G. Rhodes. 2s. 6d. net; by post, 2s. 9d.  
 Arithmetic of Electrical Measurements. W. R. P. Hobbs. 16th ed. 1s.; by post, 1s. 2d.  
 The Slide Rule. A Practical Manual. C. N. Pickworth. 12th ed. 2s. net; by post, 2s. 3d.  
 Practical Telephone Handbook and Guide to Telephone Exchanges. J. Poole. 5th ed. 6s. net; by post, 6s. 4d.  
 Telephone Erection and Maintenance. H. G. White. 1s. 6d. net; by post, 1s. 9d.  
 Common Battery Telephony Simplified. W. Atkins. 3s. net; by post, 3s. 3d.  
 Magneto and Electric Ignition. W. Hibbert. 2s. net; by post, 2s. 2d.  
 Dynamo Lighting for Motor-cars. By M. A. Codd. 2s. 6d. net; by post, 2s. 10d.

Larger or more advanced books on many of the above subjects, and also on other branches, will be recommended on application.

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**BINDING VOLUME X.**

OF

**"ELECTRICAL ENGINEERING"**

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## LIFE OF HALF-WATT LAMPS

AN installation of Osram half-watt lamps in a large paper mill, carried out by the General Electric Co., Ltd. (67 Queen Victoria Street, London, E.C.), comprised fourteen 110-volt 500-watt (1,000 c.p.) lamps. Only two of these lamps had a life of under approximately 1,200 hours, whilst ten were still in use after burning from 1,298 to 1,870 hours. The average life of the 14 lamps was as high as 1,505 hours, and the candle-power had not diminished appreciably since the lamps were installed. It is of interest to note that the lamps referred to were used under particularly unfavourable conditions, namely, in an extremely damp atmosphere where large temperature variations were experienced, and, moreover, they were subjected to considerable vibration. These figures bear out the fact that the estimate of an approximate life of 1,000 hours is a very conservative one, and in actual practice is greatly exceeded. Moreover, we are informed that this instance is but one of many, all equally satisfactory, and all users speak in glowing terms of the excellent qualities of the Osram half-watt lamp.

## CATALOGUES, PAMPHLETS, &amp;c., RECEIVED

**RADIATORS.**—A new catalogue of electric radiators, fires, and convectors of British manufacture, forming Part I. of their electric cooking and heating catalogue, is being issued by the Sun Electrical Co., Ltd. (118 & 120 Charing Cross Road, W.C.). The list is very comprehensive, and includes many types of luminous radiators, electric "fires," convectors, and factory type radiators. The Company will be pleased to send copies to any of our readers who are interested.

**INDUCTION MOTORS.**—A well-arranged list from Crompton & Co., Ltd. (Salisbury House, London Wall, E.C.), and Chelmsford, deals with protected-type induction motors for polyphase circuits in sizes ranging from 3 to about 200 h.p. with slip-ring or squirrel-cage rotors. Full particulars of outputs, efficiencies, &c., are given with dimensions, shifting specifications, &c., and prices of extras and spare parts. A leaflet from the same firm gives particulars of machines in stock ready for delivery.

**ELECTRICAL SUPPLIES.**—A leaflet from Donovan & Co. (47 Cornhill Street, Birmingham), printed in English, French, and Spanish, gives particulars of British-made continuous-current starters. Various other electrical accessories are dealt with in other cards and leaflets from the firm.

*Readers desiring copies of catalogues or pamphlets should apply to the firms in question, referring to the notice in "Electrical Engineering."*

**LAMPS.**—Three or four very humorous postcards testifying to the strength, economy, and brilliance of Pope Elasta wire lamps are being circulated by Pope's Electric Lamp Co., Ltd. (Hythe Road, Willesden).

**ALUMINIUM.**—The British Aluminium Co., Ltd. (109 Queen Victoria Street, E.C.), has issued a new and enlarged edition of the useful pocket book entitled "Aluminium: Facts and Figures." A good deal of additional matter appears, including data on bars, rods, overhead lines, circles, &c. The Company will be glad to send copies of this and other information as to the uses of aluminium to those interested.

## CALENDARS, &amp;c.

Our Editor has been very pleased to receive from the General Electric Co., Ltd. (67 Queen Victoria Street, E.C.), the fine morocco leather-covered large sized blotting book which accompanies their cordial seasonable wishes.

The Sun Electric Co., Ltd., have shown a welcome optimism in sending to their customers a cleverly constructed combined bank-note case and purse with the kind hope that notwithstanding the present crisis it may prove useful. We understand that a few of these are still left, and the company will be pleased to send one to any of their friends so long as the supply lasts.

The calendar of Pope's Electric Lamp Co. (Hythe Road, Willesden) is of the lighthouse design so eminently suitable to be identified with their wares, and is most effective.

The Hart Accumulator Co., Ltd. (Marshgate Lane, Stratford, E.), have kindly sent us an office blotter combined with calendar of useful form.

A convenient letter-opener and rule from C. L. H. Blume (The White Building, Fitzalan Square, Sheffield) enunciates two good maxims: "Use this rule in your office, and 'Megomac' and 'Insulac' varnishes in your works."

The Electric Construction Co. (Wolverhampton) have kindly sent us one of their very neat little pocket leather-covered card-case diaries for 1915.

## TENDERS INVITED AND PROSPECTIVE BUSINESS

## Generating Stations, Sub-Stations, Mains, &amp;c.

**Cleethorpes.**—Cable extensions are required.

**Heckmondwike.**—A new economiser is required.

**Llandudno.**—The Electrical Engineer has prepared a scheme of extensions. A 220-kw. Diesel engine set is suggested.

**Salford.**—A L.G.B. inquiry is to be held concerning a loan of £22,910 for electrical extensions.

**Shanghai.**—Sixty-eight three-phase induction motors in various sizes between 5 and 60 B.H.P. with slide rails and liquid starters. Consulting Engineers, Preece, Cardew & Snell, 8 Queen Anne's Gate, S.W. Jan. 12th.

**Stockport.**—An L.G.B. inquiry is to be held concerning a loan of £17,000 for electrical extensions.

## Wiring

**Dublin.**—Metropolitan police barracks. Secretary. Jan. 8th.

**Edinburgh.**—New workshops, King's Stables Road. City Electrical Engineer, Dewar Place. January 6th.

*The following particulars relate to new buildings about to be erected, or important alterations and extensions in existing buildings. Wiring contractors are recommended to make inquiries to ascertain whether electrical work will be required.*

**Birmingham.**—Extensions to West Heath Hospital. Architect, W. H. Ashford, 32 Paradise Street.—School at Hall Green.

**Coventry.**—New school.

**Ealing.**—Library (£4,600).

**Llanelli.**—Isolation hospital.

**Northwich.**—New post office. H.M. Office of Works, Storey's Gate, London, S.W.

**Portsmouth.**—Elementary school, Southsea.

**Preston.**—New baths, Saul Street.

## APPOINTMENTS AND PERSONAL NOTES

Mr. J. A. Robertson, late Chief Electrical Engineer at Greenock (now at Salford), has been granted a honorarium of £200 by the former, in connection with his work upon the extension of supply to the Port Glasgow district.

Mr. A. Coveney, late Electrical Engineer and Tramway Manager at Erith, now in private work, has been presented with a gold Albert by the staff of the Erith Tramways and Electricity Department.

Particulars are given in our advertisement columns of a number of central station appointments.

Mr. A. C. Eborall's private address has changed from Lampton (Middlesex) to 45 Addison Road, W.

A foreman linesman is required at the Dickinson Street Works of the Manchester Corporation. (See advertisement on another page.)

An electrical engineer is required for Ceylon. (See advertisement on another page.)

## MISCELLANEOUS BUSINESS NOTES AND TRADE ANNOUNCEMENTS

**Price of Copper.**—Although the Metal Exchange is not open for business in the ordinary course, Messrs. G. Smith & Son, of 5 Philpot Lane, E.C., inform us that the following may be taken as the official quotation for electrolytic copper bars, viz., £60 10s. to £61 (last week, £61 to £61 10s.).

**The Gremer Lamp & Engineering Co., Ltd.**—This Company announce their removal to larger premises at Moorfield Works, Whingate, Wortley, Leeds. Mr. C. Willan's connection with the Company has been severed, and another London representative will shortly be appointed. Meantime, all inquiries from the London district should be addressed to the Leeds works.

**Colonial Agencies.**—An Australian firm is desirous of representing United Kingdom manufacturers of electric cranes. Further particulars at Office of the High Commissioner for Australia, 72 Victoria Street, S.W.—A firm in Montreal wishes to get into touch with United Kingdom manufacturers of electric pocket-lamps and electrical advertising novelties. Further particulars at 73 Basinghall Street, E.C.

**W. A. Davis & Co.**—Mr. W. A. Davis informs us that he has terminated his agreement with the Adnil Electric Co., Ltd., and is now trading under the above style at 25 Victoria Street, S.W., as dealer in electrical supplies, making a speciality of pocket-lamp cases, refills, and bulbs.

**Russian Agency.**—An Englishman in Moscow desires to get into touch with United Kingdom manufacturers of electric lamps and fittings. Further particulars at 73 Basinghall Street, E.C.

**Liquidations.**—A first meeting of creditors of the Electro-Steel Foundries will be held at 33 Carey Street, London, W.C., at 11.30 a.m., on January 8th, 1915.

## LOCAL NOTES

**Belfast: Reorganisation of Electricity Department.**—Some time ago mysterious charges were made as regards the organisation of the Electricity Department. No details were published, but a sub-Committee was appointed and four separate reports, all of which have been rejected by the Electricity Committee, were presented. The matter has again been discussed by the Corporation in Committee, and a resolution has been passed in favour of a reorganisation of the department. It appears now that the trouble has arisen over the dismissal of three workmen by the Chief Electrical Engineer.

**Burton-on-Trent: Electricity Showrooms.**—The Electricity Department has just opened some new showrooms, which include a completely equipped dining-room and kitchen. In the latter, electric cooking apparatus is shown in actual use by a lady demonstrator.

**Manchester: Demand for Electricity.**—With the exception of the first fortnight in August, the output of current has shown regularly weekly increases of from 3 to 5 per cent. over the corresponding period last year, since the war began. The maximum demand was reached on Dec. 18th with the figure of 50,310 kw., compared with 49,897 kw. last winter. The department has to meet allowances to employees enlisted to the extent of £10,000 per annum, whilst the increase in the income tax on the profits of the undertaking

will amount to £4,600 this year. Nevertheless, it is intended to maintain the contribution to rates of £30,000.

**Rugby: Prepayment Meters.**—The Electric Lighting Committee is considering the adoption of prepayment meters.

## COMPANIES' DIVIDENDS, REPORTS, MEETINGS, &c.

**India Rubber, Gutta Percha, & Telegraph Works Co.**—There was a loss of £18,922 for the year to Sept. 22nd. This loss is attributed mainly to the diminution of sales in England due to the war and the entire stoppage of manufacturing in France from the same cause. The works at Persan have now been re-opened. By drawing on the reserve, a final dividend, making 5 per cent. for the year, is declared on the ordinary shares.

**Power Gas Corporation.**—At the annual meeting last week, Sir A. Mond, Bart., referred to an important contract for gas-driven generating plant which the Company has completed for a large Japanese scheme of railway electrification. The Japanese Government has now taken over the plant, which is at work.

**Brown, Boveri & Cie.**—The report of this Swiss firm states that the receipts for the last financial year were 9,594,395 francs (compared with 7,450,073 in the previous year), and the expenses 5,349,924 francs (compared with 4,513,676 in the previous year). After writing off 2,613,943 francs (compared with 1,511,118 in the previous year) it would have been possible to increase the dividend from 8 to 9 per cent., but in view of the new situation created by the war, only 5 per cent. is to be paid and 1,000,000 francs carried to a reserve against war losses. Last spring the capital of the company was raised from 28 to 32 million francs.

**Allgemeine Electricitäts Gesellschaft.**—See page 655.

**Mather & Platt, Ltd.**—Messrs. Mather & Platt, Ltd. (Park Works, Manchester), inform us that they have had a very satisfactory year's business. The Electrical Department has been exceedingly busy, especially in connection with the electrification of mines, collieries, and textile factories both at home and abroad. Many other industries have also seen the advantages of electrification, notably flour millers, and an installation has just been completed at a flour mill aggregating some 2,000 B.H.P. Large numbers of the firm's water filters, high-speed vertical duplex gas engines, and turbine pumps have also been supplied.

**International Engineering Congress, 1915.**—We have already referred to, and contradicted, a rumour that this Congress was to be abandoned. We have now been officially informed that the electrical section of it is definitely abandoned, but that the remainder of the Congress will proceed in accordance with the original programme.

**Royal Institution.**—A course of experimentally illustrated lectures on "Science in the Home," adapted to a juvenile auditory, will be given by Prof. C. V. Boys as follows: Jan. 5th, "Heat in the Home"; Jan. 7th, "Electricity in the Home"; and Jan. 9th, "Light in the Home."

**Private Companies.**—The second edition of a book entitled "Private Companies, their Utility and the Exemptions they Enjoy," by Mr. H. W. Jordan, has been published at the price of 6d. net by Jordan & Sons, Ltd. (116 and 117 Chancery Lane, W.C.), company registration agents. The advantages of forming businesses into private companies are explained, and a good deal of useful information as to those sections of company law which apply, and the procedure to be adopted both for the registration and carrying on of new private companies and their subsequent conversion into public companies, is given.

**Electro-Harmonic Society.**—A smoking concert will be held in the Holborn Restaurant (King's Hall) to-morrow (Friday) at 8 p.m.

**Meter Approved.**—The Board of Trade has approved the Electrical Apparatus Co.'s E.A.C. induction motor meter, type H.T., and the means for fixing same.

**Contraband of War.**—A new list of contraband articles, taking the place of previous lists, has been issued. The new list includes as absolute contraband, copper (unwrought and part wrought), copper wire, aluminium, rubber (including raw waste, and reclaimed rubber), goods made wholly of rubber, and tungsten.







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(Established 1884)



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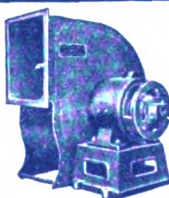
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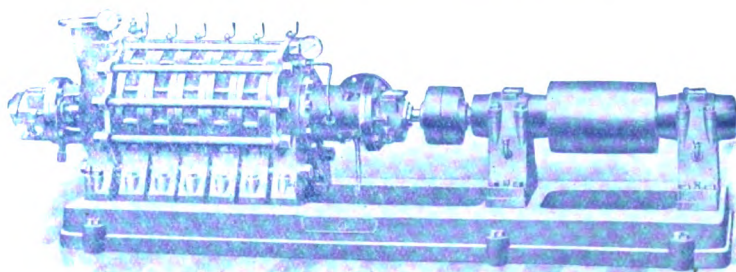
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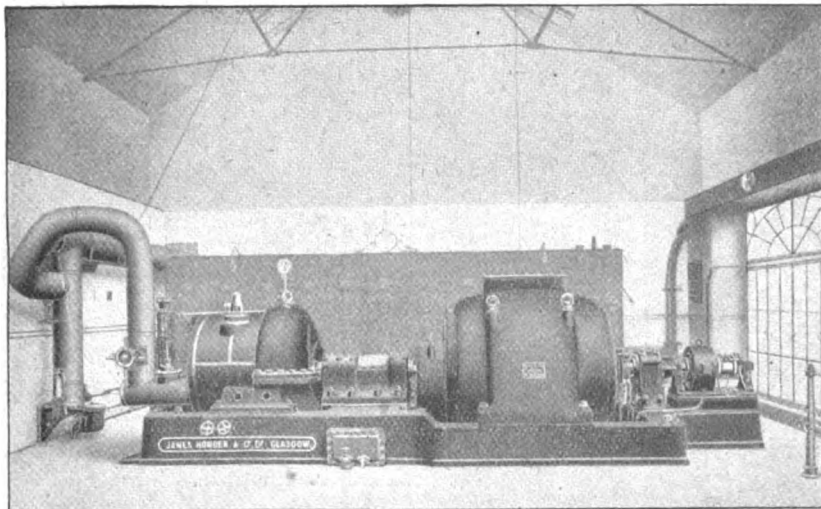
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Rashleigh Phipps & Co., 147, Oxford Street, W.  
(7906 Gerrard).  
Rawlings Bros., Ltd., 82, Gloucester Road, Kensington, W.  
(3370 Kensington).  
Speedy, Eynon & Co., 6, Duke Street, Adelphi, W.C.  
(8967 Central).  
Trollope & Colls, Ltd., 77, Grosvenor Road, S.W. (1971 Victoria),  
also 5, Coleman Street, E.C., and at Dorking, Surrey.  
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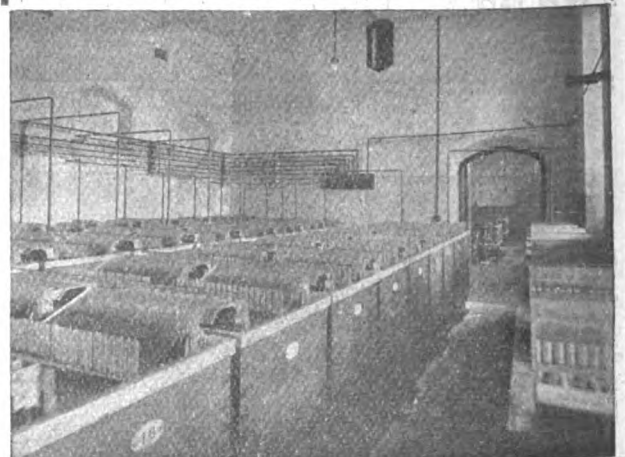
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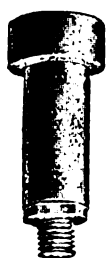
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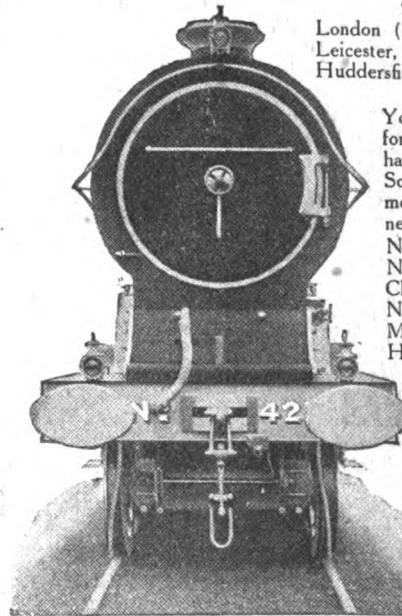
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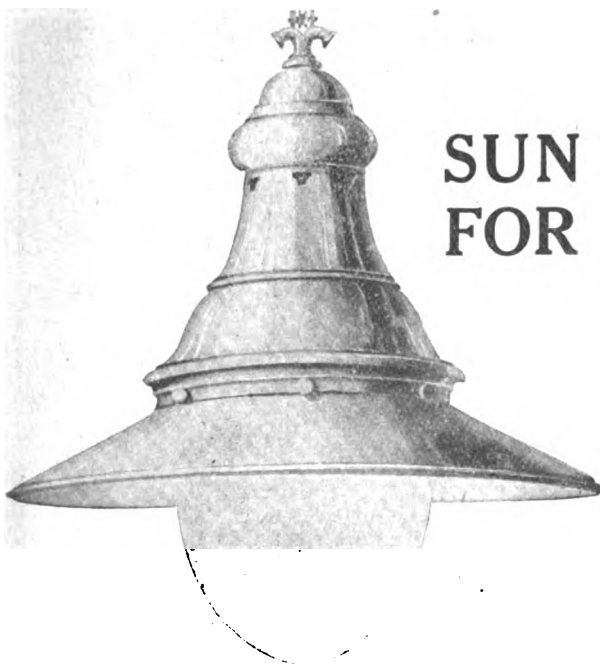
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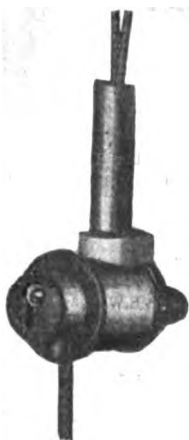
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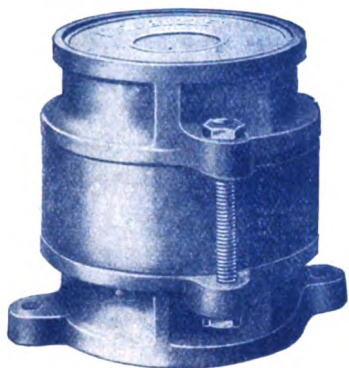
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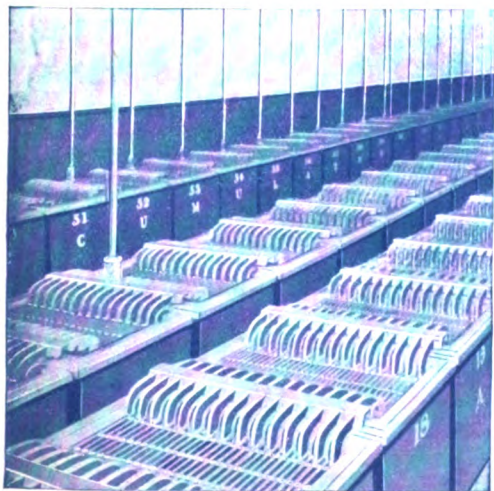
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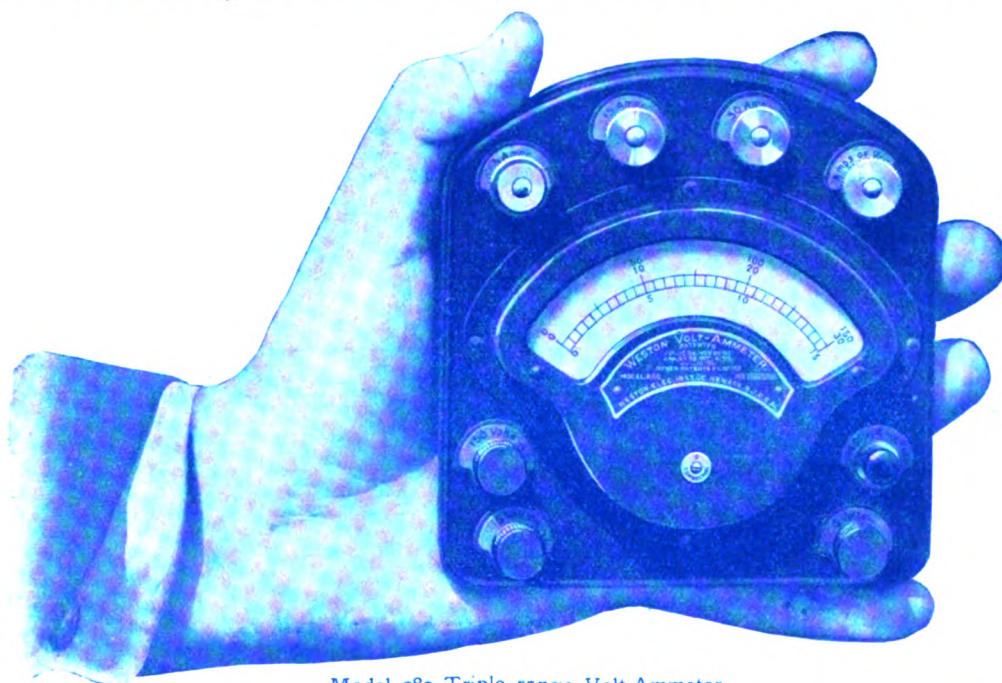


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